Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT

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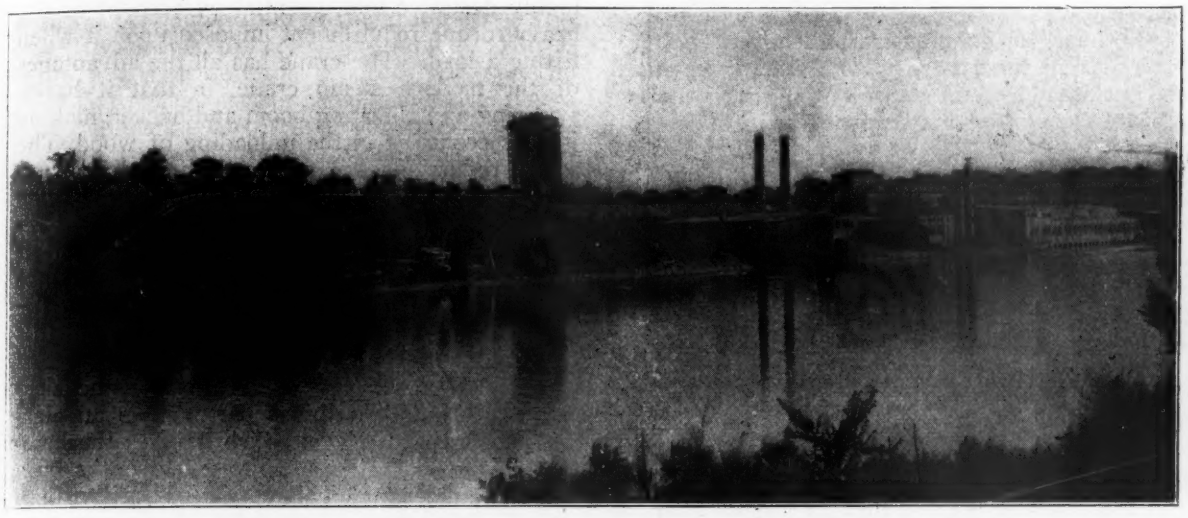


Fig. 1.—The Interlake Mills, Showing Large Storage Conveyors at the Left.

Electric Power in the Manufacture of Sulphite Paper Pulp

Interesting Features of Electric Motor Drive and Control as Exemplified in Interlake Mills Employing the Mitscherlich Process

By R. L. GREGORY

Chief Electrician, Interlake Pulp & Paper Co., Appleton, Wis.

We have witnessed during the last decade one of the greatest periods of industrial development that the world has ever known. Several causes have led to this effect, but without doubt the greatest of all is that of the recent world conflict. Coming as it did at a time when our country with its industrial activity was just nicely recovering from the slump beginning in 1907, this war demanded of the manufacturing world a production such as it little dreamed of. And agreeable to the economic law of supply and demand, it necessitated that, in order to meet the great demands thrust upon the markets, industries as a whole would have to devise means of hastening up production.

The logical outcome of such a condition was at once apparent. The home, the social, the business and industrial elements of our great commonwealth were immediately called upon to adopt a plan of saving and substitution, that the necessities for carrying on the great war might be obtained and a supply had to meet the ever increasing demand.

One of the most noticeable growths resulting from this extraordinary condition was probably that of the pulp and paper industry. Paper was substituted in extensive quantities, replacing metals, wood and textiles in order that these materials might be turned into munitions of war. Where manufacturers formerly used wood and tin cartons for packing their goods they began substituting the paper and cardboard carton. Other articles of substitution were paper bandages and wrapping for textile, paper rope for hemp, and many too numerous to mention were met with in every day life. This, added to the daily increasing use of paper for ordinary purposes, made the heaviest demand upon the paper mills that the trade has ever known.

Naturally with this increased demand upon the paper industry came an increased demand upon the sulphite manufacturing plants, since the body of a great proportion of our paper (newsprint, book and wrapping) is composed of the sulphite fiber. Consequently there sprung up in various sections of the country new sulphite mills and those already operating were invariably found increasing their supply to meet the demand by putting in additional machinery and equipment. The installation of new equip-

ment also meant the use of more power for driving purposes and invariably this was obtained through the medium of the electric motor.

Of all the classes of industrial development there is probably no other in which the kinds of machinery used, or the requirements imposed upon the motor are as varied as that found in paper and pulp mills. This variation has made

Fig. 2.—Another View of Storage Conveyors and of Wood Storage.

demands upon the control and motor manufacturer for special equipment and newly designed apparatus, and today we find in almost every mill something original and specially designed to meet local conditions of operation.

The Two Sulphite Processes.

The two chief methods of sulphite manufacture are those commonly known as the "long cook" or Mitscherlich process, and the "quick cook" or Ritter-Kellner system. The chief differences are that in the Mitscherlich process the wood is cooked in the digestors by heating the acid by means of steam coils which line the inner walls of the digestor, the steam being under comparatively low pressure. The Ritter-Kellner process heats the wood and acid by passing steam directly into the digestor at a much higher pressure and while the wood cooks much faster the steam also dilutes the acid, with the result that the final product is not as good a fiber as that produced by the Mitscherlich process. However, the quick-cook process is that mostly adopted throughout the country, especially where the sulphite is made for local consumption. The reason for adopting the quick-cook process is that the original cost and also the upkeep of a plant manufacturing sulphite by the Mitscherlich process is much greater than one manufactured by the Ritter-Kellner method, it taking a greater amount of machinery and equipment to manufacture sulphite by the former process.

Since the mills manufacturing sulphite under the Mitscherlich process require so much more extensive machinery and of necessity of a much more varied line, this fact, coupled with the advantages found in the electric drive, has made its adoption universal as far as such mills are concerned.

One of the largest mills in the country manufacturing sulphite by the Mitscherlich process for marketing purposes is that of the Interlake Pulp & Paper Co., of Appleton, Wis. At these mills the use of the electric drive has proven very satisfactory and from the time that the wood leaves the cars on its way to the slasher and cutoff saws until it comes off the machines in the form of the finished product, electricity and the electric drive form an important factor through the various stages of production.

The wood is unloaded at the sawmill by means of an electric crane which is operated by a 25-hp., three-phase, 220-volt motor. This motor is of the wound-rotor induction type which is highly desirable and essential on account of the heavy torque requirement imposed upon it when lifting a load. The crane has all the advantages of the modern steam crane, in that it has a swinging and elevating boom and bucket, making it very economic in the unloading of wood. The speed reductions are obtained through a combination of gears and pinions. This crane is one of the modern applications of electric power recently added to the sawing department and it may be truly termed a labor-saving device, since it formerly required several men to unload the wood which is now exclusively handled by this one crane and the operator.

The next interesting application of the electric drive found in this department is an electrically driven carriage, which handles the hemlock logs when being cut into 2-ft. lengths by a large circular saw. This carriage is driven by a 15-hp. wound-rotor motor, which is reversible in operation. It is belted to a countershaft, which in turn is belted to another countershaft equipped with four sets of gears. These gears work in conjunction with geared plates attached to the carriage, the carriage itself riding upon four guides equipped with rollers. The operator throws his controller on the forward position and as the carriage moves forward and the cut begins, he advances his controller, cutting out the resistance by means of secondary clapper switches until the cut is finished. He then throws his controller into the reverse position, bringing the carriage back to its original place.

Next he operates his lever handling the live rolls, which are driven by means of gears and

Fig. 3.—Method of Mounting Control Apparatus in New Acid Plant of Interlake Mills.

pinions from a 10-hp. alternating-current motor. This moves his load ahead and he is ready for the next cut. The carriage control is also equipped with limit switches on both the forward and reverse side, in order to stop the carriage in case the operator fails to do so at the proper place. The speed of the motor driving this car-

riage is necessarily slow and the starting torque heavy, therefore considerable testing of the proper steps in the resistance was made before the proper speed relation was obtained. This carriage is used when sawing hemlock logs, but when sawing spruce the slasher saws are used since with the spruce, being of smaller size, a greater quantity can be cut in the same length of time.

In conjunction with the slasher saws we meet with the first application of the group drive, several saws being driven by one motor. This is one of the most desirable group drives found on the plant. The slasher saws are driven by a 50-hp. induction motor of the wound-rotor type and this is controlled by a General Electric oil circuit-breaker with a secondary control.

As we follow the process along, the next interesting application of the electric drive is found in connection with the large storage conveyors which are shown in Figs. 1 and 2. This system consists of two conveyors, an upper and lower one, both being of the cable and button type. These cables are driven over heavy sprockets by means of a set of steel gears and pinions, which in turn are belted to a 25-hp. motor of the wound-rotor type. The upper conveyor distributes wood to the storage pile from the saws, while the lower takes the wood either from the saws or the storage pile and conveys it to the soaking pond, where it is thoroughly soaked before going to the barkers. Wound-rotor motors, governed by Cutler-Hammer control apparatus, consisting of controller, resistance and a primary magnetic switch, are used in this installation.

After leaving the soaking vats or hot-pond, the wood is sent to the woodroom where all bark and rotten wood is removed and the wood then prepared by the chippers and crushers for use in the digestors. In this department we find varied conditions of the motor drive. Most of the conveyors having more or less of a constant and continuous load are driven by squirrel-cage motors with the ordinary belted drive which proves quite efficient.

One of the principal machinery parts of the woodroom is the barking equipment. The two American barking drums installed at the Interlake mills are driven by two 56-in. Sampson water wheels, which operate by means of a belted counterdrive and the use of friction clutches. Many mills operate these barkers with motor drive, but the water-power drive has proven quite successful here, since there is a great and constant changing of load in this process of barking. On account of this condition, if the motor drive is used, specially constructed motor and control equipment should be used to get the proper results.

Working in conjunction with these drums are several hand barkers, all of which are driven by 7½-hp. motors of the squirrel-cage type, operating at a speed of 850 r.p.m. These also have proved very efficient. Each motor is controlled by a safety switch easily accessible to the operator. In this particular drive the motor is directly connected to the barker shaft by means of a solid coupling and while the starting torque is heavy, due to the barker disks which must be gotten under motion, still squirrel-cage motors are adaptable on account of the inertia of the disks having a great effect in lessening this torque, once the barker is gotten up to speed.

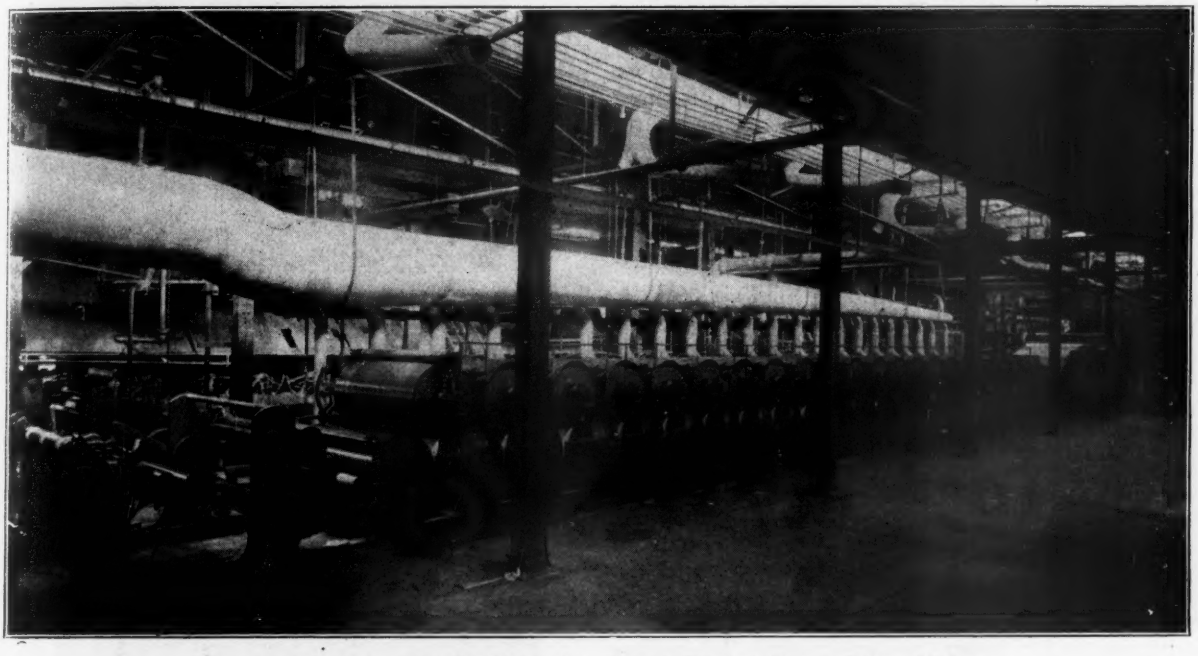


Fig. 4.—New 96-in. Pulp Machine—Note Supply Feeders Strung Below Girders.

After the wood has been barked it is ready to be chipped. The two chippers are motor-driven, both being belt drives. The load on a chipper is probably the most varying of all in the process of the wood preparation and one test made on an 88-in. three-knife chipper showed that it varied from 56 hp. to 129 hp. input while chipping. This, of course, might be due to any of a number of causes, among which are:

1. Condition of the wood being barked.
2. Rapidity of the feed into the chipper.
3. Condition of the chipper knives as to grinding and setting.

4. Condition of the chipper equipment itself relative to alinement, etc.

5. Conditions found in the motor and electrical equipment.

With the amount of power required to drive a chipper depending upon so many varying conditions, the advisability of using a wound-rotor motor in preference to a squirrel-cage type is quite apparent. Volumes could be written upon the drives best adapted to this sort of machinery and a wide field for investigation is open to the engineer who wishes to get the greatest production out of such equipment on the least amount of power.

Practically all the wound-rotor motors operating in the foregoing departments are operated by means of controllers designed with extra fingers and contacts which are used in energizing the magnetic switches employed in these installations, all magnetic switches being equipped with no-voltage and time-element relay features as well as overload provision. These controllers must be thrown to the first position at which time the extra fingers make contact, thus energizing the magnetic switch which in turn closes the circuit. However, there are two or three installations which operate by means of an oil switch that closes the primary circuit, the motor being brought up to speed by means of secondary control.

After leaving the woodroom, the chips are conveyed by means of a belt conveyor to the distributing bins or hoppers above the digestors. This conveyor is also motor-driven. The digestor department equipment needs but little electrical drive outside of the centrifugal pumps which supply water for cooling and washing out of digestors and for use in the stock pits and in the acid plant.

Drive for Centrifugal Pumps.

This brings out another entirely new phase of the motor drive and conditions entirely different are applicable to the centrifugal pump drive. Some of these pumps are used for the purpose of supplying water under pressure, while others are used to supply it in volume only. All pumps are directly coupled to the motor by means of either a solid or flexible coupling. The motors are all of the squirrel-cage type, operated by potential starters, some being equipped with automatic control arranged for two-minute starting duty. Normally the centrifugal pumps are designed to run at constant speed but as each installation of centrifugal pumps is a special problem conforming to local conditions, both motor and pump should be designed to meet these conditions if the best service is to be obtained.

This is one department which is very essential in the pulp and paper industry, since vast amounts of water must be used in the process of manufacture. The water is filtered through both flat and rotary filters and every effort made to keep it free from impurities which may affect the cleanliness of the pulp. The centrifugal pump is a problem in itself which necessitates the utmost care in daily operation in order to keep it in constant operative condition. Fig. 3 shows the method of mounting control apparatus in the new acid plant under construction at the Interlake mills.

Leaving this department, we come to the machine room where we find the finished product coming from the machines. Here we find a varying line of machinery to which the motor drive is most suited for operation. Among these

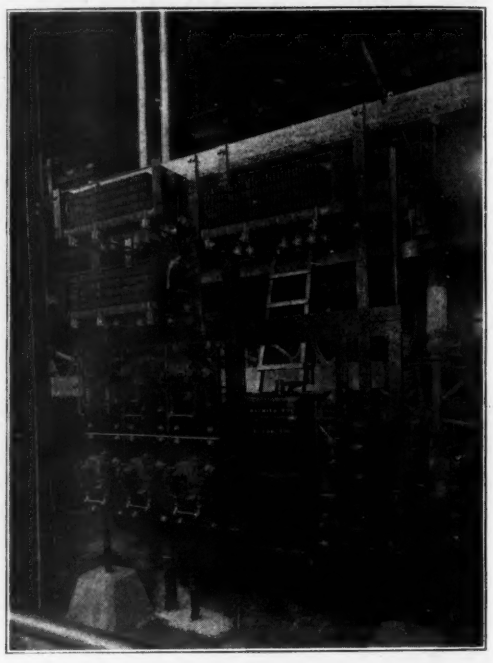


Fig. 5.—Special Speed Regulating Control Panel for New Pulp Machine Shown in Fig. 4.

are the stock-breaker, savealls, knot-catchers, pumps, thickeners, vacuum pumps, stuff chests, agitators, beaters, Jordan engines, fans, screens, driers and wet end drives, all operated by motors and drives of various natures, including back-geared motors, worm drives, belted drives and direct-connected drives. From the above list it is very apparent that these drives must be of a varied nature but only a few will be mentioned here.

First, the knot-catchers are operated by back-geared motors directly connected to a geared trunnion drive on which the knot-catcher or screen operates. The function of this apparatus is to allow the stock to pass through, but in so doing to separate all knots, sticks and screenings from the good stock. The motors operating these drives are of 20-hp. rating and of the squirrel-cage type. Tests made upon them show that the load varies from 14 to 23 hp., depending upon the amount of stock passing through; the average load required 19 hp.

Another drive of interest is that operating the Jordan engines. These motors are of the squirrel-cage type with a rating of 65 hp. but often develop a momentary input of 85 to 90 hp. Motors applied to the operation of Jordan engines vary in size, depending upon the size of the Jordan and the condition of the stock. The size of the motors required for driving a Jordan generally ranges from 50 to 250 hp. Constant care must be given the Jordan engine and its operation, as it is an easy matter to use more power than necessary to obtain the desired results if the Jordan is set up too tightly.

One of the best drives found in the mills is that installed on the new pulp machine shown in Fig. 4. This drive consists of a Westinghouse 75-hp. wound-rotor motor belted to a countershaft which is supported by bearings on the steel structural uprights of the building. This counter is in turn belted to four sets of bevel-gear drives on the driers. The press rolls on the wet end are also driven by the same motor. The control apparatus is of special design made by the Cutler-Hammer Manufacturing Co. and consists of a special feed-regulating device. The equipment for this control is shown in Fig. 5 and consists of a type KS starting drum and a master controller of the radial-handle type with points for seven speeds in either direction. The KS starting drum is supplied with an additional control finger which supplies the feed circuit to the speed-regulating master controller.

The control panel itself consists of one No. 14 alternating-current clapper switch for the primary circuit and four No. 13 switches without blowouts for controlling the secondary circuit of the motor on speed regulation. The panel furthermore contains two inverse-time-element overload breakers with automatic reset feature. This entire control with its regulating resistance is mounted on an insulated iron framework. Its operation is as follows:

The motor is gradually brought up to speed by use of the drum-type starting switch. The

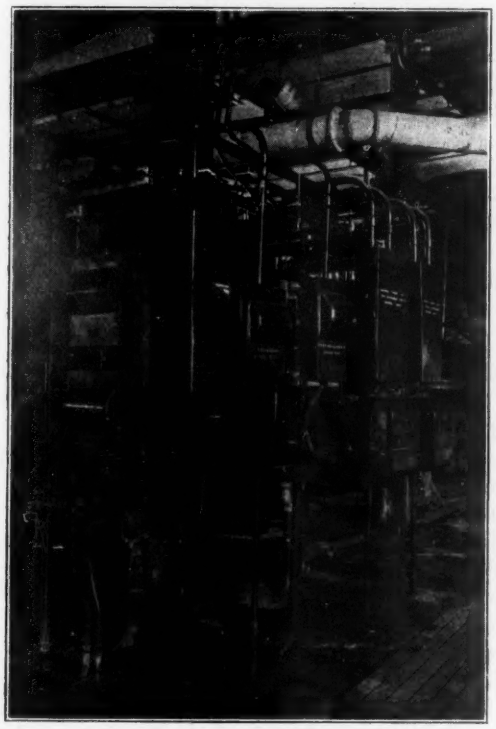


Fig. 6.—Showing Method of Centralizing Control Apparatus and Using Safety Inclosed Switches, Starters and Panels.

operator then uses the radial-drive master in order to cut out as many steps of regulating resistance as necessary to obtain the desired speed. There is an interlocking device between the drum-type starting switch and the master which prevents the cutting out of any of the regulating resistance until the starting drum has been brought to the full "on" position. This control gives a speed reduction of 20% in five steps.

Another feature in the electrical installation of the Interlake mills is shown in Figs. 3 and 6. This shows the method of grouping several potential starters and control apparatus on one framework mounting, which not only gives centralized control but also makes a neat and compact system. The feed circuits to the different controls are supplied from a common bus feed from the main power stations. This also eliminates line losses to a great extent and makes maintenance and the locating of trouble an easier task. The supply mains for these various group mountings are strung from the overhead girders on suspended arms, the method being shown in Fig. 4.

Most of the energy used is made at the plant by means of belted water-power units running in parallel with steam-driven units, the latter consisting of a Corliss engine and a General Electric Co. Curtis turbine. This turbine is of the noncondensing type, it being operated at 15 lbs. back pressure, exhaust from which is used for drying and heating purposes. The remainder of the power required at the plant is purchased from the local traction company and the main feeders are so arranged and tied into a common bus that by the use of oil circuit-breakers of the automatic type all can be operated in parallel or as separate units.

The arrangement of motors and motor drives in paper and pulp mills with respect to the machinery to be driven depends upon a number of factors, chief of which are local conditions to be met with and, secondly, the general layout of the plant. The individual motor drive is given preference in the sulphite mill chiefly because of the type of machinery necessary to the process, but in paper mills where several beaters and such machinery is used, we often find the group drive used, one motor driving several beaters.

The advantages of the electric drive over other types of drives give the two following results in most industrial plants. First we find that the consumption of power is decreased and, secondly, the production is generally increased for a given amount of equipment. These two advantages may be secured through several different methods among which are:

1. Centralizing power supply and control.
2. Flexibility of power supply and simplicity in distribution.
3. Standardization of equipment.
4. General care and maintenance.
5. Reduction of friction and belting losses.
6. General layout of new installations.
7. Wide choice of motors and control equipment.
8. Study and tests of various drives installed.

With the ever increasing use of the electric drive for industrial purposes and by use of the above methods, an enormous field is opened to the engineer in the studying and the handling of the special problems relating to the application of motor drive in industrial plants. It thus becomes his duty to reduce these various problems to a scientific and practical basis of operation and analyze them in order to secure the highest degree of efficiency.

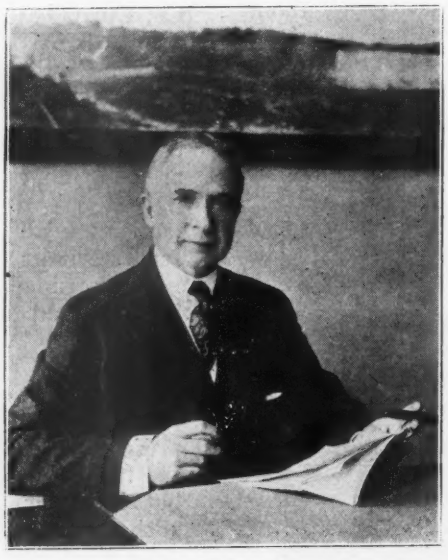
Progress of the American Institute of Electrical Engineers

Unbroken Record of Growth in Membership, Professional Standing and Influence of the Organization — Plans for the Broadening Out of Institute Activities Being Put Into Effect

By CALVERT TOWNLEY

President, American Institute of Electrical Engineers.

The American Institute of Electrical Engineers begins 1920 in a prosperous condition. Organized in 1884 by a handful of devoted enthusiasts, it has an unbroken record of growth in numbers, in professional standing and in finances until it now has a membership of 10,500, including a very large majority of all the professional electrical engineers of standing as well as of those interested in the allied arts and sciences. It long ago entered into the most cordial fraternal relations with other prominent national engineering societies and for many years has co-operated with them, with the public authorities and with the industry towards the establishment of a high plane of professional and business conduct, the advancement of the science and art of electrical engineering and the public welfare.



Calvert Townley.

There have been established in many of the important cities of the country local sections of the American Institute of Electrical Engineers constituting centers of activity which are working vigorously and successfully for the accomplishment of the aims and objects of the organization as above described. The sections assisting in this way now number 34, and new ones are being organized from time to time. In addition to these sections, branches have been established at 62 universities, colleges, and technical schools of standing by means of which the students at these institutions may come together and enjoy the advantages of professional association.

The Institute is a joint owner with three other national engineering societies of splendidly built and equipped headquarters in New York City, including its share in this property, owns assets which on April 30, 1919, were certified by public accountsants to be valued at $610,633.80.

Many years ago the Institute established and now maintains through suitable representatives and committees, cordial relations with corresponding engineering societies in Europe and through them is constantly engaged in endeavoring to improve international relations and to eliminate, as far as possible, all artificial barriers and differences of standards.

During 1919 the Institute undertook and concluded a comprehensive and complete review of its own activities, duties and privileges with respect to its internal affairs, its relations with the public and with other engineering bodies. One result of this review has been the preparation of a plan for a closer co-operation among all professional and technical men of the nation to the end, among other things, that the federal, state and municipal authorities and the public in general may—when they so desire—have the benefit of disinterested technical advice in any of the numerous matters which have to be dealt with and regarding which by training and experience engineers and technical men may be peculiarly qualified to serve.

Beginning with its January issue, the Institute will increase the scope and it is expected the usefulness of its monthly publication, and it is hoped and believed that it may not only continue in the future as in the past to keep up with the march of the nation's progress but may increasingly serve its large and growing membership and become even more essential than heretofore to the profession which it has served.

RADIO GROUND WIRES.

A meeting of the Institute of Radio Engineers was held in the Engineering Societies Building, New York City, on the evening of Jan. 7. A paper on "The Use of Ground Wires at Remote Control Stations" by Lieut. Commander A. Hoyt Taylor and Lieut. A. Crossley was presented. This paper dealt with the increasingly important problem of simultaneous transmission and reception of sustained and damped wave signals at the same or different wave lengths. Valuable data on the most recent stations of this type were presented.

How Packing Affects Distribution of Lighting Fixtures

The Part Carton Packing Will Play in the Merchandising of Lighting Fixtures Through Jobbers and Contractor-Dealers

By F. B. RAE, Jr.

Will the packing of lighting glassware in cartons lead to the handling of this material by electrical supply jobbers?

That is one of the first and most important questions asked in any discussion of the carton proposition. For if the proposed reform in glass packing does not operate to include the jobbers it is not going to be much of a reform, and if it does include them it will mean an important step in facilitating the distribution of lighting equipment to the public.

Behind this lurks another question which every jobber is asking himself, namely, how far is the fixture dealer going into the sale of electrical merchandise other than fixtures? There can be no doubt that there is a marked tendency at this time for concerns heretofore restricted almost solely to the sale and hanging of fixtures and the accompanying glassware to reach out in some degree toward collateral merchandise. Some tend toward the furnishing field and are selling andirons, fireplace tile, door stops, door knockers, jardinieres, vases (which are sold "as is" or made up into portable lamps), decorative shades and a considerable variety of similar novelty merchandise. Others lean more toward electrical lines and offer appliances, especially the fancy percolators, chafing dish sets, etc. As the fixture trade edges into this field, it becomes increasingly interesting to the electrical jobber.

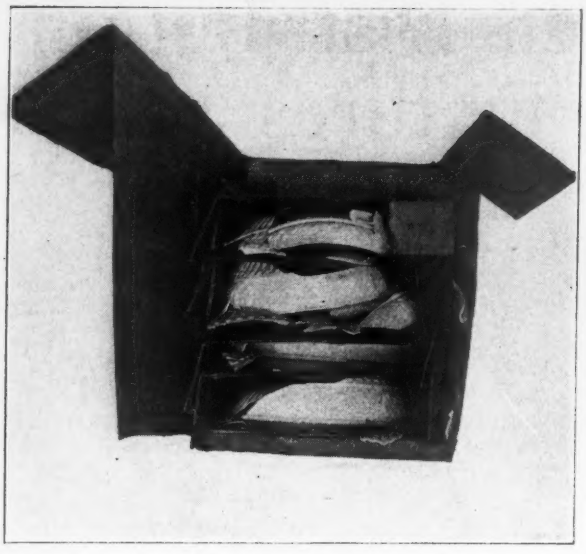
There is another force at work upon the jobber. With the constant trend toward higher intensities in commercial illumination, a variety of standard lighting units have been developed which it is to the obvious advantage of the wholesaler to handle. At the present time quite a number of units, such as the Brascolite, Sa-lite, Reflectolyte, Duplexalite, Denzar, Four-in-One, Ace and others, are in the market. These units are packed one in a box, generally complete. They can be dumped into stock and hustled out again without any measuring, weighing or repacking expense. They sell like hot cakes and a jobber would have to be blind on the profit side to overlook them.

Finally, there is a third factor in this jobbing-of-glassware problem. It is the growing importance of the electrical contractor-dealer as a distributor of lighting equipment. Nobody can deny that the small-town and the neighborhood electrical shops are doing a respectable proportion of the plain, everyday fixture business. Practically all of them carry and sell ordinary brackets, pendants and portables. That business is growing.

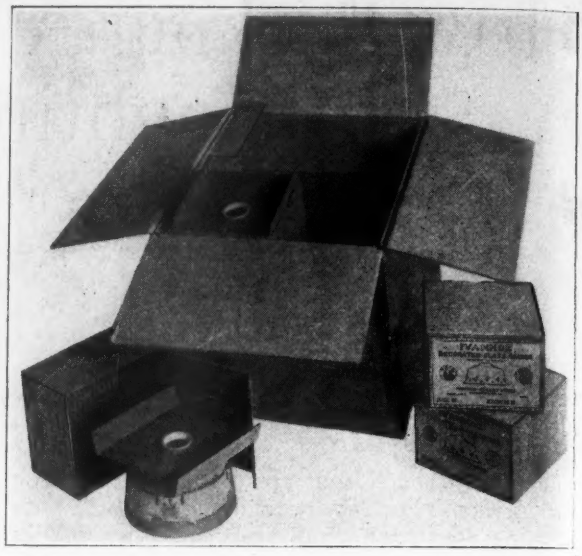
So if the present regular electrical contractor-dealer trade is edging into the fixture business and if the fixture dealer is edging into the electrical merchandise business, and if both are deep in the business of selling and installing commercial units which today are a considerable item in the jobbers' business, it looks very much as though all three are going to be links in the chain of distribution of illuminating glassware, provided that glassware is so packed that it can be stocked, handled, sold and reshipped with a rea-

One reason why the jobber cannot afford to handle illuminating glassware. Stock held in bins is easily broken, hard to keep in order and requires the most careful re-packing for transit to the customer.

Glassware in cartons is safe, clean and easily identified. In most cases it goes to the customer in the original package, requiring less labor and time to handle in the jobber's warehouse than most material.



Not all carton packing is an improvement. Here is a "horrible example" showing what happens when manufacturers try to cheapen cartons. Reputable boxmakers will not knowingly supply cartons which are unsafe.



The better grades of lighting glassware will be packed in individual cartons, eight or twelve to the case. They go onto the dealers' shelves in their decorative boxes, safe and clean until sold.

sonable margin of profit. It is entirely a question of handling, not of selling.

The first thing for the jobber—and the trade—to realize in this connection is that glass so handled must be restricted to condensed lines of absolutely standard shades. The lines selected must be of better than common quality so that they will bear a substantial profit. They must be of such design as to be available for use in practically any room in the average home. Given

Another reason why jobbers cannot afford to handle barrel-packed illuminating glassware on any but a standard-package basis. This fellow eats up all the profits.

these three characteristics—limited lines, fair quality and wide adaptability—and we have merchandise that the jobber can handle with success.

There are today a number of jobbers who handle glass successfully. One case especially which comes to mind concerns a jobber who carries a considerable stock, sets his own prices on same, and charges the dealer 10 to 15% above the manufacturers' prices for equivalent goods. This jobber's customers pay the differential for three reasons: they save freight from factory to jobber's warehouse; they save delay because they can get prompt deliveries from the jobber's stock, and they turn their money faster because they have no capital tied up in goods in transit.

This jobber solved the barrel-packing problem by putting an almost prohibitive price on less than package lots, a profit of practically 100% being the rule where the dealer takes a broken package. This discourages dinky, hand-to-mouth orders, at the same time that the prompt, efficient service on barrel lots brings in the kind of orders that pay.

Whether or not the electrical supply jobbers will become really active factors in the distribution of lighting glassware depends also in considerable measure upon the quality of the cartons adopted by the manufacturers. Poor containers alone will practically eliminate jobber participation in this business. Nor is it enough that glass be packed in cartons of such design and quality as to carry safely to the jobbers' storerooms; these containers must be able also safely and surely to withstand the grief of re-shipment to the dealer. Re-packing and the breakage incident thereto represents greater expense, in practice, than the margin of net profit.

Carton packing is not going to revolutionize the distribution of lighting glassware overnight, though we believe it will do so gradually. Far-sighted jobbers are going to study the problem, test it in practice and lay their plans according to definite knowledge based on experience. Short-sighted jobbers are going to airily dismiss the idea as impracticable without knowing anything about it either way. Ordinary jobbers are going to sit on the fence. The writer recommends that those on the fence keep their eyes open.

CANADA TO ELECTRIFY RAILROAD TERMINALS THROUGHOUT LAND.

Electrification of all railroad terminals in Canada within a comparatively short time has been predicted by D. B. Hanna, general manager of the Canadian Government Railways. The new system would have many advantages over the use of steam in the handling of trains in big yards, he declared.

Status of Hydroelectric Development in America

Development Remains Inactive Due to Uncertainties of Costs and Legislation—Tendencies in the Technical Line—Pending Water-Power Legislation by Congress

By LAMAR LYNDON
Consulting Engineer.

A review of the activities in hydroelectric development for the past year shows but a meager accomplishment. There were but few plants of any importance which were either begun or came into use during the year. The reasons, of course, were: Excessive costs for labor, material and equipment, accompanied by the natural fear of investors that any capital sunk in industrial projects would suffer a serious diminution due to the inevitable reaction from the present era of high prices with a consequent reduction in costs of all commodities, including labor and equipment. Another feature has been the general attitude of regulating bodies in different states which in many cases have imposed onerous requirements on public utilities, including, of course, hydroelectric plants.

Some large generating units have been constructed for the Niagara Falls Power Co., three of these having been ordered, each having a capacity of 32,500 kv-a. These are among the largest electrical generators which have ever been built.

The Junction development of the Consumers Power Co. in Michigan was put into commission a short time before the beginning of the year 1919.

Considerable new construction work was done by the San Joaquin Light & Power Corp. of Fresno, Cal. The new plant, designated the Borckhoff power house, when completed will deliver about 30,000 kw. to the transmission network of the company.

These form the more important developments. Renewed activity is, of course, expected during the present year and it is possible that at the expiration of another twelve months there will be considerable additions made to existing plants and many new ones completed and put into operation.

The tendencies of design have been more and more towards simplicity and elimination of complex arrangements and accessory apparatus. An excellent example of a plant of this character is that before referred to, viz., the Junction plant of the Consumers Power Co. in Michigan.

This tendency applies not only to hydroelectric developments and generating apparatus, but also to the electrical equipment. Designers have almost universally adopted the scheme of making a generator with its individual set of stepup transformers a single unit and the complex switching arrangement by which different banks of transformers can be switched to and from different generators is being practically abandoned.

Another feature that is becoming universal is that of placing piers with movable gates on the crest of the dam, in order to maintain high working head and produce a greater storage capacity than could be obtained if the normal level were that of the crest of the dam. Such movable gates, or flashboards, do not increase the flood level of the impounded water because, during periods of flood they are lowered, or tilted, so that the flow over the crest of the dam is not obstructed.

The recent plants, almost without exception, have been equipped with vertical turbines and umbrella type generators direct-connected thereto. In most instances the turbines have been set in scroll cases of concrete, the intake, the case and the draft tube being practically a monolithic mass. Turbine efficiencies as high as 93%, with setting of this character, have been reported.

Both the Kingsbury and roller bearings have been used to support the vertical thrust due to the weight of the rotor and waterwheels with connecting shafts, but the Kingsbury bearing is used much more than any type of roller bearing. The adoption of oil-pressure-operated governors has become practically standard.

Transmission-line voltages have marched steadily upward, until an operating voltage of 220,000 has been definitely proposed. Such high-tension systems work successfully and with no more trouble and less interruptions than do many of the lower voltage systems. Very few insulator breakdowns are reported. This is due to the fact that the operating voltage which the line and the transmission system have been designed to withstand is very near to the corona voltage and any line surges or sudden, excessive voltages proceeding from any cause are dissipated by the corona discharge so that it is practically impossible for excessive voltages to be impressed on the line at any point.

Water-Power Legislation by Congress.

One of the most interesting and important occurrences during the year 1919 relating to hydroelectric power was the preparation of an act of Congress providing for the licensing of the use of Government lands and navigable streams for hydroelectric development. This bill passed the House of Representatives last July. It modifies or removes most of the objectionable features which have heretofore attended the construction of hydraulic works on Government property or navigable streams. The bill is much too long to be quoted here but, in substance, it provides that

a license may be given for the period of 50 years, at the end of which time the Government has the right to take over the then existing property at a fair valuation based on its net cost. If the Government does not elect to do this, the license may be renewed, though not necessarily, for another period of 50 years. Meantime, the licensee is required to meet certain stipulations, which, however, do not appear to be onerous or unjust.

There are, however, some features which should be modified in order to prevent possible injustice to the projectors of the power development. One of these is the clause that the plans of the dam must be approved by the chief of engineers of the Army and the Secretary of War. It is quite proper that the plans of all structures affecting navigation should be subject to such approval, but if the construction of the dam itself must be satisfactory to engineers other than those engaged by the company, it practically takes the engineering of the most important part of the development out of the hands of the investors. It may also lead to the loss of considerable sums, due to the expenditures of moneys for preliminary engineering and the preparation of plans and specifications, which latter may then be rejected by the War Department. The War Department requirements might be such as to make the project commercially impracticable.

This same remark applies to the clause which states that the method of development shall be such as in the judgment of the Commission is best adapted to a comprehensive scheme of public service, and if the plans do not meet the views of the Commission in this respect, modifications of such plans and specifications may be required before a license is granted.

Another clause stipulates that after the first 20 years of operation, the licensee shall set aside certain amortization reserves proceeding from profits over and above a reasonable rate of return on the investment. The term "reasonable" is too broad, indefinite, and elastic to mean anything at all. A "reasonable" rate of return for Government securities and enterprises is 4%, while that for a public utility is more nearly 8%. There is a wide latitude between these two "reasonable" figures, and without something more definite investors may hesitate to sink funds in any enterprise, the net return from which may be arbitrarily limited and be less than that obtainable elsewhere.

Another clause provides that if the United States does not exercise its right to take over a plant at the end of the term of the license, the license shall be renewed from year to year, until the property is taken over, or until a new license, under possibly different terms from that of the original one, is granted. This is wholly impracticable. If the licensee has made a sufficient sum during the life of the license to pay a fair return on the investment, and, in addition, to amortize the entire cost, or even a substantial portion thereof, the development will have been reasonably profitable, but if these conditions have not been met, and the plant must run for an additional period in order to make a sufficient sum to meet these ordinary financial requirements, the issuing of the license from year to year would mean nothing. No utility, and least of all a hydroelectric development, can operate on twelve-month periods, with the prospects that at the end of any year the ownership of the property will terminate. Such an arrangement would kill initiative, and retard, if not wholly prevent, any extension of plant or equipment or improvement in methods of operation to meet the needs of the public depending thereon.

RECENT DEVELOPMENTS IN HIGH-TENSION INSULATORS.

Review of Conditions as to Insulator Manufacture —Improved Insulator Performance.

By A. O. Austin,

Factory Manager, The Ohio Insulator Co.

Until the early part of 1919 labor conditions were such that many improvements tending to materially increase the life of high-tension insulators could not be fully carried out. The past year, however, has seen a considerable improvement, particularly in the refinements in the manufacture and assembly of insulators which will certainly materially increase their life and improve their reliability.

Records from the field covering a period of four or five years show that losses during this period of time have been a small fraction of 1%. This almost unbelievable record has been produced with material sent out in large quantities and shows the care and attention given the manufacture of insulators during the last few years. These remarkable records from the field show that the hazard, insofar as the insulator is concerned, is a negligible one, at least for a period of years and that the real problem, if any, is to increase the life of the insulator. The development in the art has been principally along the latter line and will result in savings which will run into very large sums in the course of time.

Although the improvements have not been spectacular, the improvements to the insulator and to the transmission field have undoubtedly been greater this year than at any time in the history of the business. This has been partly due to the fact that improvements were held back to a certain extent owing to war conditions.

Improvements in the art have made it possible to design insulators for greatly increased mechanical stress without necessarily sacrificing the life of the insulator materially. While it has been possible to construct a line of over 200 kilovolts for over a number of years, the future line at the higher voltages can be installed more cheaply owing to the improved methods of design and manufacture which have been placed in commercial use in some of the smaller types of insulators during the latter part of the past year.

The future outlook is an exceedingly good one and it seems fairly certain that a line of over 200 kilovolts will be installed during the coming year. The problem, so far as the use of the extremely high voltage for transmission purposes is concerned, is not one of insulation but of regulation.

Conditions of business indicate that there is considerable electrical development laid out for the beginning of 1920.

Year's Achievements of Westinghouse Company—Part II.

Review of Developments in Switching, Protective, Railway and Marine Apparatus and in Miscellaneous Appliances

Instruments.

During the year has been developed an improved type of automobile ammeter; and a double type of graphic instrument, arranged with two records on the chart, such as frequency and voltage, or voltage and watts, or watts and reactive component, the latter being very useful for kv-a. analysis.

To meet the growing demand for instruments of smaller size, together with increased sensitiveness and greater accuracy, the type BX instrument for the measurement of voltage and current has been developed. It combines extreme delicacy of action with high sensitivity and ruggedness, and the design, construction and materials, are such that the instruments are permanently accurate.

The type CO relays have been modified to include high-capacity contactor switches, thus greatly extending the application of relays for use with various types of circuit-breakers.

Switching and Protective Apparatus.

A buggy type tank lifter has been developed for use with oil circuit-breakers, for the removal by one man with little effort, of large tanks containing 21 gals. or over of oil, while the tanks are full.

Another development is a so-called periscope for use with high-tension floor mounting oil breakers, which by the use of a high-power Mazda lamp, gives the workman adjusting these breakers in the field a ready and easy means of determining the condition of breaker contacts without having to empty the oil from the tanks and enter into the tank itself.

There has been brought out a new design of remote mechanical control for rheostats where chain operation has been used in the past. A new and less expensive ground mounting switch and meter house, known as type F, is also announced.

The past year has indicated the necessity, in case of a certain few extremely high-powered stations having unusually low generating voltage, for a different form of contact in Westinghouse oil-breakers than the ordinary brush contact which has been employed to date. This new type is called the reversed-brush, and it is contemplated that within the next several months the entire line of high-powered cell-mounting breakers will be equipped with these reversed-brush contacts.

The most important development in carbon circuit-breakers has been to meet the new navy department specifications in which the shock test requires a design of breaker different from any produced. This test has been successfully met with sample breakers on overload and inverse time element. These breakers will be supplied as a part of the electric propulsion outfits on the battleships and battle cruisers for which the Westinghouse Co. has contracts.

Past year experiences have fully demonstrated the effectiveness of the new type AL impulse gap and the fact that it has made available a degree of protection from static disturbances more nearly complete than ever before. The demand for the arrester has continually increased and the development has been carried up to 88,000 volts.

For 2500-volt distributing transformer protection, the type CR arrester has been produced, mounted in a wooden box to provide for operators who prefer an insulating form of box to an insulated metal box. The type S form of low equivalent arrester has been redesigned so as to be more compact in size and a 5000-volt rated arrester has been added to the line. Suspension type choke coils have been changed in design by adding spiders at each end of the coil supporting the wooden cross strips and thus rigidly holding the coil in shape against all mechanical stresses. An eye has been provided in each end to give a stronger strain connection with the line wire, the electrical connection being separate from the strain connection.

A line of renewable fuses has been developed, including all standard capacities up to 600 amperes, 250 and 600 volts. These fuses have been developed to meet the new specifications of the Underwriters' Laboratories and will consequently many times interrupt safely the maximum amount of current which standard enclosed fuses have been called upon to interrupt in underwriters' tests in the past. The line of safety type wood box distributing transformer fuse boxes has been extended to 100 amperes, 7500 volts.

A new line of disconnecting switches has been partially developed up to 15,000 volts, 2000 amperes. These switches have a higher than usual factor of insulation and mechanical strength and are provided with a simple but positive locking device to meet the stresses imposed by modern conditions in the handling of larger amounts of power.

Krantz Products.

The type WK-53 new house-entrance switch is 100% safe. It is for house-entrance service and also used for industrial purposes where a switch of not over 30 amperes is required. The switch, which is enclosed in a steel box, is of the knife type operated by an outside handle and provided with a quick-break mechanism. The door can be opened only when the switch is in the off position and the switch cannot be closed

when the door is open. The fuses are therefore dead when exposed. It is furthermore impossible to reach live parts from the fuse compartment.

The type WK-100 safety motor starting switch affords absolute protection to the operator (regardless of experience) as well as to the motor and at the same time costs so little as to warrant its installation with every induction motor of one to 10 hp. capacity, single or polyphase.

Extreme simplicity of construction is particularly noticeable in the design of this switch. The first cost is low and at the same time it possesses an unusual number of protective features that make it especially desirable for general use.

A new floor box called the type CT is installed with the minimum amount of work. The cover can be turned in any direction and raised or lowered, being held in place with cement, which is furnished with each box. This floor box is universally adjustable and is water tight.

Mining.

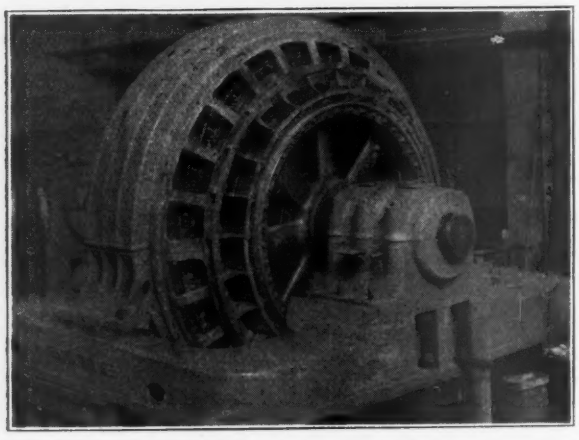
In this field the company has made improvements and refinements in the mechanical parts of storage-battery locomotives and has also installed larger storage batteries.

The bearings on synchronous converters used for mining purposes have been changed from the bracket to the pedestal type. Motor-generators have been placed on an 80% power-factor basis instead of 100%.

Trolley mining locomotives have been made in fewer sizes, a number of less popular weights being eliminated.

Electrical Railways.

The developments of 1919 in heavy traction work have resulted in the largest electric locomotive yet built and applied to both the alternating and direct-current systems. The company is building for operation on the Chicago, Milwaukee & St. Paul Railroad ten 4000-hp. d-c. locomotives to operate from a 3000-volt overhead trolley. These engines are to handle all the passenger service over the present electrified section of the road.



Westinghouse 3500-hp. Direct-Current Reversing Blooming-Mill Motor Shipped to Imperial Steel Works, Japan.

In addition, there has been placed in service a new type of substation apparatus which has shown very superior results, both as regards overload capacity, which is some 12 to 14 times the full load current, without flashing over, and which in addition has incorporated in its design a scheme by which the voltage in case of extremely heavy short circuits is so reduced internally that the flash over is eliminated. This device is known as the flash suppressor. It has been in very successful operation for several months.

The other novel development in connection with this heavy traction installation is the use of the power indicating and limiting system which has been designed and installed by Westinghouse engineers on the new electrified zone of the C., M. & St. P. road. This system accomplishes three things: it indicates the total amount of power at one point, namely the chief despatcher's office; it also integrates this power; and in addition it limits the power drawn from the line to a predetermined amount. That is, this system so functions that in case a traffic overload occurs the voltage in the substations will be automatically reduced thereby slowing down all trains and keeping this load within pre-determined limits as specified by the power requirements.

In the a-c. field, the Westinghouse Co. has supplied the New York, New Haven & Hartford Railroad with five new locomotives, 50% larger in capacity than any that they have previously operated. These are of the a-c.—d-c. type and similar in design to the former engines, except that one additional pair of driving axles is added to each truck, making a total of six per engine, as compared with the former engines which had four.

The service in connection with the Hell Gate bridge has been inaugurated during the past year by which the passenger trains from New England and the South are handled by electric locomotives over the a-c. zone of the New Haven road and over the d-c. zone of the Pennsylvania Railroad, passing through the Pennsylvania station in New York and thereby eliminating the old system of ferriage.

During the past year the large a-c. freight locomotive built for the Pennsylvania Railroad has been put in commercial operation on the main line electrification at Philadelphia and has been doing wonderful work. This engine represents the maximum in horsepower for electric freight engines, having a capacity of 4800 hp. and a total weight of 250 tons.

The outlook for the future in heavy traction work is very promising, as the war conditions have brought home to most people the desirability of economy and conservation in fuel and at the same time the advance in wages has necessitated a renewal of the study of operation with a view to cutting down to a minimum the use of labor for the accomplishment of a fixed result in both operation and maintenance of railroads.

In general, the greatest developments during the year, in the street railway field have been the perfection of motor details and standardization of safety car equipment. On account of the pendulum swing to somewhat heavier weights in safety cars, namely, from 13,500 to 16,500 or 17,000 lbs., motors with more capacity and larger

bearings, etc., have been developed to meet these heavier weights and insure the usual margin of capacity in the motor sizes.

The greatest contribution to the art in street railway practice this year is the helical gear.

The action of this type of gear is best realized by considering it as made up of a number of thin spur gears with the teeth of each successive gear element advanced through a small angle relative to its neighbor. It then becomes clear that only one tooth of one narrow gear enters into contact with the corresponding tooth of the single narrow pinion at any given time. The shock resulting from this entry bears to the whole operation an importance depending directly upon the thickness of the narrow gear and pinion element; but in helical gearing, the width of the element is zero, therefore the operation of helical gears is very smooth.

Now, although the distribution of load over the tooth is much better in helical than in spur gearing, there will still be a certain amount of tooth deflection, and it will, therefore, be helpful to consider briefly the entry of the helical gear tooth into its work. Due to the departure from parallelism to axis, one end of the helical tooth enters the mesh in advance of the rest of the tooth. As this end picks up its load, it must deflect; but the secret of success in helical gearing lies in this point, that only a small portion of each tooth picks up its load and deflection at any given time, and the resulting shock and vibration, as proved by actual service, exist only in theory and cannot be detected by ordinary methods.

Helical gears transmit practically average motor effort with well maintained bearings. Therefore, there are no peaks of effort to cause local departure from the original contour of the tooth and, again, helical gears tend to wear evenly over the full tooth length, thus preserving their original tooth form.

The absence of shock and vibration decreases bearing wear, reacting advantageously on the gear performance and helical gears have longer life than spur gears.

The noise accompanying the operation of spur gears in railway service is a direct by-product of shock and vibration. Noise means expense. Since helical gears operate without shock and vibration, they operate with practically complete silence.

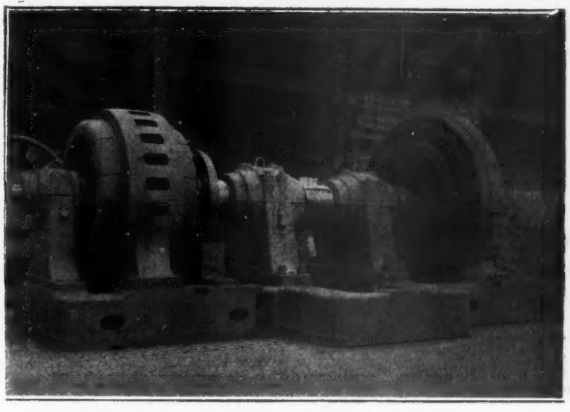
Another development is the use of foot control for small cars.

With the use of door devices necessitating, in many instances, line current breaking switches separate from the K controllers, a small light weight electrically operated line switch has been developed and 50 equipments sold to the Brooklyn Rapid Transit Co.

The perfection and use of dipping and baking as a measure for increasing reliability and reducing maintenance costs has resulted in this process being adopted by a great many railway companies.

Marine Apparatus.

The nation-wide merchant shipbuilding program previously in effect was abruptly halted at the time the armistice was signed, and the greater portion of the year of 1919 was devoted to its rearrangement. Accordingly, normal progress was not made in the way of development of machinery for marine purposes. During the last few months, however, conditions became more nearly adjusted and contracts were closed for several geared steam turbine ship propelling equipments. Some of these are of the divided flow type, while others are of the cross-compound type which has a very high record for successful performance in practice and has fully demonstrated its right to this important application. These classes of turbines meet fully the post-war requirement for high efficiency propelling machinery.



Flywheel Motor-Generator Set for 3500-hp. Blooming-Mill Motor—The Flywheel (Not Shown) Will Fit Between the Two Middle Bearings.

The navy department has pushed forward with its previously established policy of using turbine electrical propulsion equipment for superdreadnaughts, and has placed orders for four such equipments. The general scheme follows closely the one used by the Westinghouse Company for the Battleship *Tennessee,* which has been launched and which will be subjected to its sea trials early in 1920. A single induction motor is directly connected to each of the four propeller shafts. Electric power is furnished by two turbine generator units which receive their excitation from auxiliary turbine generators. The desired ship speed is obtained by varying the number of poles of the motors and by changing the frequency impressed upon them. The latter is accomplished through varying the turbine speed by means of governor control. The four new battleships, *South Dakota, Indiana, Montana* and *North Carolina,* are larger and of higher speed than previous battleships, and accordingly require 60,000 s. hp. each as compared with approximately 27,000 s. hp. for the *Tennessee.* In addition to the above, the Westinghouse Co. had previously received contracts for the electric propelling machinery for the superdreadnaughts *Colorado* and *Washington,* and for the battle cruisers *Constellation* and *Ranger.*

Appliances.

The main development of the year was in connection with an automobile engine heater. It is also noteworthy that modifications in other appliances were made which comprise a new

type of iron, a new toaster and a departure in radiators.

The newly developed automobile engine heater is designed principally to keep the engine warm while standing in the garage and to insure easy starting. It is practically indestructible and its power consumption is only 100 watts.

The old 6-lb. iron has been superseded by a new type weighing 6½ lbs. This new iron is a decided improvement, as it incorporates the sheeted type enclosed element, renewable terminals, flanged base, and has a high nickel finish. The enclosed element is especially noteworthy from the fact that it is very easy to replace.

The new type of turnover toaster which has just made its appearance differs from the old-style toaster in that it has a mica element wound with ribbon resistance instead of the porcelain brick style with coil element. There has also been added insulated feet, and knobs on both ends of the rack.

The "Cozy Glow" radiator is a distinct departure from the usual run of radiators on the market today. The large reflector causes better distribution of heat and the element is mounted so as to give maximum radiation and efficiency. The simple construction and easy removal of all parts for replacement constitute a noteworthy feature.

Notable Export Shipments.

Especially prominent among the company's export shipments during the year have been the following:

Steel Mill Equipment: Seventeen carloads of electrical equipment for steel mill operation are now being delivered for installation with what will be the first electrically-driven steel blooming mill to be erected in the Far East. This equipment is to replace a steam engine now operating a 40-in. reversing mill.

The mill will form a part of the plant of the Imperial Steel Works of Japan located near Tokio. The blooming mill in question will be capable of rolling steel ingots measuring 500 by 500 millimeters and weighing 3000 kgs. or 5000 kgs. maximum. The capacity will be 50 tons per hour.

The mill will be operated by a 3500 hp. single unit motor, of the reversing blooming mill type, taking direct-current power at a voltage of 600 and operating with a speed range of 0 to 100 r.p.m.

Steam-Driven Turbine Units: Two 25,000-kw. steam-driven turbine units of Westinghouse make, which, when installed, will complete the largest steam-driven electrical installation in the Far East are now being erected at Osaka, Japan, for the Osaka Electric Light Co. Located in an extensive industrial district, this company furnishes light and power to street railways, steel works, shipbuilders, copper refining plants, paper mills, electrochemical installations and other industries.

It is noteworthy that in 1908 the Osaka Co. installed three steam turbine units of 3000 kw. each. In 1910 two more units of like capacity were added, and in 1911 two 5000-kw. units. The 25,000-kw. units now being installed will bring the capacity of this plant up to 100,000 hp. All these are Westinghouse units.

Electric Furnace Equipments: Electrical equipment for twenty electric furnaces which, when placed in operation, will comprise the largest electric furnace installation ever made, has been manufactured by the company and shipped to the Glomfjord Smeltverk Co. of Glomfjord, Norway.

The apparatus is divided into units, each unit comprising the equipment for one furnace. Each of the twenty units includes a 1300-kv-a. single-phase main power transformer, a 26.2-kv-a. series transformer a 26.2-kv-a. induction regulator, an automatic selector switch, a transformer switch and a two-panel separately mounted switchboard for the control of the electrical apparatus. Sixteen thousand two hundred gallons of oil for insulating and cooling the transformers and regulators were part of the shipment.

Conclusion.

The trend of the year's developments would seem to indicate:

1. A growing tendency toward the centralization of power generation for large areas. This is evidenced by the ever-growing loads on the stations of public utility companies, with a consequent demand for larger power units.
2. A generally acknowledged pre-eminence of electric drive in the industrial field. Most modern factories and mills are now using this form of power in preference to steam.
3. An increasing use of electric power for industrial heating as shown by the success that is being accomplished in the electric welding field; the demand for electric furnace equipments; and the increasing popularity of the numerous smaller applications in this line.
4. That electricity is beginning to revolutionize agricultural life not only by making it more profitable, but by providing it with many of the comforts and conveniences heretofore found only in the city.
5. The increasing application of electrical appliances to the performance of various duties in the home, thereby eliminating much of the drudgery and bringing cleanliness and comfort.
6. The approach of an all-electrical age, in complete reality.

ALL-ELECTRIC STEEL MILL FOR OHIO.

Steel Men Form $1,500,000 Company in Youngstown to Produce Alloy Steels.

A company to operate the first all-electric steel mill in the country, construction of which is to be begun in February on a site between Girard and Warren streets, Youngstown, Ohio, has been incorporated at $1,500,000.

The plant, which is to be the base of a larger plant later, will have two electric smelters and 10 and 16-in. rolling mills. It will make the finer grades of steel, vanadium, chrome and nickel steel for use in automobile parts, locomotive parts and cutlery. It will employ 500 men at the start.

L. J. Campbell, vice-president of the Youngstown Sheet & Tube Co., has resigned to take charge of the new mill, it is announced.

TURBINE RUNNER MAY CHANGE HYDROELECTRIC DEVELOPMENTS.

High Speed, Efficiency and Simplicity Salient Feaures of New Form of Runner.

A new type of runner for hydraulic turbines was described by Forrest Nagler before the December meeting of the A. S. M. E. in New York. The author is hydraulic engineer, Allis-Chalmers Manufacturing Co., and his paper described designs, tests and experiments carried on by him on this new form of runner. The design of this runner is based on a straight radial blade, which offers the absolute minimum of wetted surface and of bending moment on the root of the blade. These features offer added simplicity and inexpensive production costs.

Commercial Advantages.

Up to date seventeen commercial runners of this type, varying from 80 to nearly 1000 hp. in capacity, have been built or are building for a total of nine plants. Nine of these have been tested out thoroughly in place with an actual showing of characteristic speeds often over 200 under abnormal low-head conditions when synchronous speed was maintained during high water.

Numerous and sometimes unexpected advantages have been found to result from the simple and open form of runner. For example, a runner may be taken out and another substituted for capacity variation under flood conditions or for test purposes without removing any other turbine parts except two or three guide vanes. In two plants this was made use of to install a high-capacity runner for obtaining more power during flood periods. Likewise these higher-capacity runners were made by using the original core boxes, which means that blade angles were unchanged, the result being accomplished simply by using a different number.

The greatest mechanical advantage arises from the fact that the runner cannot clog up with sticks, blocks, leaves, or other debris, a feature which the author's experience with the average low-head installation would indicate should result in several per cent more power the year around.

The primary advantages which were anticipated and which have proven out in practice are as follows:

(1) Lower generator cost due to an increased speed of 50% and over above previous practice. This saving varies from 15 to 35% of the generator cost, depending on its size and speed.

(2) Lower turbine cost due to simpler runner. This averages around 10%, the runner being about one-third the weight of the corresponding mixed-flow type and much easier to build, either solid or with separate blades.

(3) Smaller generator diameter, which in turn means a smaller power house.

(4) Higher generator efficiency due to better design possible with the higher speed. This is seldom less than 2% gain and may conservatively be stated to vary from 1½ to 3%.

(3) Greater turbine flexibility, which permits the plant to give more power under flood conditions when the head is greatly reduced. This runner has an overspeed of about 100% as contrasted to perhaps 60 to 75% for previous types. This means that its efficiency and consequently its power will not become zero until the head has been reduced to about one-quarter normal as contrasted to four-tenths or one-third normal for reaction types. This advantage lies not solely at the extreme limit of minimum head, but at all abnormal heads or speeds, as the efficiency is less affected than with the other types.

At the present time efficiencies equaling the records of reaction (Francis) wheels have not been reached, but they are being approached rapidly and with the inherent advantage of better generator efficiency, equivalent combined results for the unit are only a matter of short time. Fundamentally the axial-flow runner should give greater efficiency than the mixed-flow purely from considerations of wetted surface and hydraulic friction, to say nothing of the simpler form permitting of greater accuracy of construction and more correct design.

Conclusions.

In conclusion it is probably well to outline a few of the possibilities resulting from the development of this runner. In pointing these out it is realized fully that such features as the limit of application to higher heads and possibilities of pitting can only be determined by practice.

In low-head plants where all large power is to be developed it is desirable to use units as large as are feasible. Practical limits, however, are set by generator speed and by size of parts which may cause difficulties in manufacturing, transportation, or in placing these out it is realized fully that such features as the limit of limit is raised by the new design in that for any given generator speed more than doubled the power can be developed per unit than with the mixed-flow types of reaction wheel.

More general though equally significant illustrations of the extent to which the new type of runner may increase possibilities of hydroelectric development are afforded by the consideration of the following: With any given limit of minimum generator speed and for any given power, the new type of runner will permit turbines to operate under heads one-half as high as those required by the mixed-flow (Francis) runners of prior practice. Similarly, for large powers such units can be developed with low runner cost and without transportation difficulties. As an illustration, this design is the basis of some contemplated units of 800 hp. each under 9 ft. head at 90 r.p.m., a design which, it may be said, incidentally eliminates all gates on the turbine and effects all regulation from gates which form part of the power house on the discharge side of the turbine.

Probably the most novel application is to horizontal plants where it is necessary to replace old turbines but desirable to retain the electrical equipment. This has already been done, a single high-speed runner replacing an old quadruple turbine and giving the same speed and more power with the same head.

Applying an axial-flow guide case with two 45-deg. bends in the draft tube gives as simple flow as possible with any arrangement and contrasts very favorably with the four 90-deg. bends given to the water with a radial-guide-case setting of a horizontal unit. This arrangement and, when floods are prevalent, the single vertical setting using a hydraucone regainer are probably the most advantageous forms of hydraulic-turbine settings that can be devised.

HYDROELECTRIC POSSIBILITIES FOR DUNDEE, SCOTLAND.

Report on Possible Developments of About 40,000 Hp. in the Dundee District.

The scheme for harnessing the waters of certain Scottish lakes to generate electricity for Dundee was dealt with recently by Prof. A. H. Gibson, of the University College, in the course of a lecture before the Business Club of Dundee, Scotland.

After discussing the possibilities of the nine schemes drawn up by the Water Power Committee of the British (Government) Board of Trade—which, allowing for losses in transmission and transformation, could deliver at least 1,000 million kw-hrs. per annum within a radius of 80 to 85 miles—Professor Gibson said that, from a Dundee point of view, the most interesting plan was that involving the use of Lochs Ericht, Rannoch, and Tummel. The possibilities of the Tummel scheme were pointed out some time ago by Major Richardson, the city electrical engineer. At that time various considerations, chief of which were the comparative cheapness of coal and the relatively small demand for electric power in Dundee, rendered it doubtful whether any commercial advantage was to be gained by pursuing the matter in detail. The recent Board of Trade examination of the scheme showed it was the largest and, with two possible exceptions, the cheapest large water power per horsepower that could be developed in Scotland.

The gross horsepower from the combined schemes will be 42,600, or, allowing for 10% loss in transmission, 38,400 continuous 24-hour electric horsepower. The cost of the complete scheme, including construction, compensation, land, and transmission and allowing for construction charges 100% in excess of pre-war rates, is estimated at $340.65 per electric horsepower delivered. The scheme has the advantage that it can be developed in three stages. The total length of the transmission line from the farthest power house in Loch Rennoch would be 66 miles.

There are other incidental advantages accruing from the regulation of the stream flow rendered possible by the increased storage accommodation. The liability of floods down the Tay Valley would be largely reduced, while the dry-weather flow of the Tay at Perth would be practically doubled. This regulation of the upper waters, with the consequent regulation of the flow below Ballinluig, would make possible the use of any suitable waterpower site on the lower reaches of the Tay. There is at least one such site near Stanley.

Regarding the possibility of obtaining power from the tidal rise and fall in the Tay Estuary, Professor Gibson stated that theoretically some 25,000 continuous 24-hour power could be developed from this source—somewhat less than that available from the complete Tummel scheme. It would involve the provision of a dam, with navigation locks, across the Tay at Broughty Ferry, and of high-level reservoirs, either on the Tayport or the Ferry side of the river.

There are enormous difficulties to be overcome in such a scheme, and the cost is likely to be much greater than that of the normal water-power scheme. In time necessity will probably enforce the development of all such resources, and it is encouraging to know that Dundee could, if necessary, develop some 70,000 continuous 24-hour power, or 200,000 8-hour power, without the expenditure of any coal; but, for the time being the river and lock scheme is so much more promising that, in the opinion of Professor Gibson, it would be waste of time to consider any such tidal schemes.

RADIOTELEPHONE AIDS FOREST SERVICE.

Made Regular Equipment in Service of Western States—Aids in Fight on Forest Fires.

The wireless telephone, as a result of a season's tryout in Montana, during which the handicaps of "packing" instruments over a 30-mile mountainous trail, the perils of passing through a forest fire, and numerous other tests were applied, has been pronounced a success for Forest Service work by officials of the service.

Hereafter wireless telephone instruments are to be a part of the standard equipment of the Forest Service.

At the direction of Chief Forester William S. Graves, tests of this plan of communication were initiated last season by R. B. Adams, telephone engineer, who was assisted by Everett Cutting. United States Signal Corps standard sets were selected for the experiment, and one was placed in position, after almost interminable difficulties, at the Mud Creek ranger station, near the Lolo Hot Springs, Mont., and another at Beaver Ridge, Idaho.

While the air-line distance between the two stations is but 12 miles, the distance by trail is 30 miles, much of it almost impassable even with pack animals. At last, however, after mishaps that included pack horses slipping off the trail, packs displaced and rolling down mountainsides, and batteries and equipment all but lost, the antennae were hung high on convenient pines.

"The sets were used during the fire season of 1919 in reporting fires and otherwise in the carrying on of the fire campaign with eminently satisfactory results," says the Forest Service statement.

The real test came during the destructive forest fires in the Clearwater forest in northern Idaho. Over 90 miles of ordinary telephone line was destroyed. The trees from which the wire was suspended were burned. Telephone communication was thus ended and the efficiency of the fire-fighting organization correspondingly reduced. It took over a week to restore this communication.

In marked contrast was the effect of fires sweeping near wireless stations. With the flames dangerous near the Beaver Ridge station the operator promptly transferred the entire equipment to a hastily constructed log raft which he had put afloat on a nearby lake, navigated to a safe distance from shore and awaited the passing of the fire. After the front had passed he returned to shore, set up his equipment and within an hour was making a report.

Editorial Comment

"Home Rule" for Public Utilities

On several occasions during the past year we have commented on the efforts made in various parts of the country from time to time to revive what is called "home rule" of public utilities. Although those efforts have had no practical success, because of the generally high standing which state commission regulation has established for itself and because of the many evils which formerly accompanied local regulation and of whose recurrence there is no assurance, yet it pays to keep close watch in every state of the Union lest the believers in fair and scientific utility regulation be caught napping by the politicians advocating city control.

An instance of the need for continued watchfulness is the present situation in Illinois. The convention for the revision of the state constitution has opened its sessions in the capital and it is understood that a determined effort will be made to re-establish local control for the larger cities at least. A number of the delegates to the convention have stated they favored some such provision in the new constitution. It therefore behooves those who see the advantages of state-wide utility control and the serious shortcomings of localized regulation to present all the facts bearing on the question to the convention itself or to its committee that will consider this matter.

Among these indisputable facts is the steady progress of state commission regulation so that now none of our states is without some form of it and the tendency is toward increasing the powers of the regulating commissions instead of restricting them. Wherever state regulation has been given a fair trial its superiority to the spasmodic and unscientific, if not demagogic, local control has been quickly shown. The latter has not only been inequitable in many cases but has proven expensive to the public and almost invariably results in deterioration of service.

Since we are dealing with Illinois conditions especially, the utility situation in Chicago may be of special interest. The city was accustomed to revising certain of the utility rates at intervals of about five years and at each such revision was wont to engage the services of experts for several months at rates of $50 a day or more. In several cases the rates finally chosen were not accepted by the utility, for example gas rates, and almost endless and very expensive litigation resulted. The regulation by the State Public Utilities Commission, on the contrary, has been methodical, definite and unbiased in results and inexpensive because its investigations have been conducted by the Commission's regular staff of engineering and accounting experts.

We are convinced that the clamor for home rule would not have been revived if it had not been for the necessity of increasing many utility rates to meet the heavy cost increases due to the war. In the meantime all the facts should be fully and fairly considered before a step backward is taken in this matter that affects so important a public service.

Making the Small Plant Modern

Mechanical stokers have been developed to meet a condition, or rather a set of conditions, that have in turn arisen because of other conditions. In any installation mechanical stokers may be installed primarily for any one of several reasons, and yet they may be installed because each one is of primary importance. In other words, no other method of handling the solid coal would be practical. This is the condition that obtains in the large central station. And it is the condition that is obtaining in the smaller stations to an ever-increasing extent.

With boilers rated at 1000 hp. and more, it would, obviously, not be feasible to handle coal by hand. And then the same boiler may be called upon to double and treble its steaming capacity at any time, which in turn means burning even greater quantities of coal in proportion. Here labor precludes hand firing, while physical conditions also prohibit it.

For hand-firing efficiently we are told to fire little and often, which means uniform feeding of coal to the fuel bed in small amounts so as not to cool the fire and yet maintain rate of firing according to the rate of demand for steam, a condition that tends to prevent smoke also. Mechanical firing fulfills the doctrine of fire little and often and, therefore, tends for higher combustion efficiency and a greater degree of smoke abatement than is the case with hand firing. Here combustion efficiency and smoke reduction favor mechanical stoking.

Under conditions common to central-station operation, rapidity of action and wide range as to production of steam are *sine qua non*. With mechanical firing, the rate of coal consumption can be varied over a wide range and in short

time. The range is the greatest and the time the shortest with the underfeed stoker, of course, and it is quite feasible although not always desirable to go from a banked fire to 450 per cent and more of rating in less than ten minutes with this type of stoker. To do so is, of course, objectionable, but oftentimes unpreventable.

While mechanical stoking raises the average combustion efficiency, permits rates of combustion far in excess of those practical with hand firing and lowers the labor cost immensely, many small plants—stations containing a few boilers of a few hundred horsepower apiece—are able to obtain the former two advantages of the mechanical stoker but fail because of cost, station layout, lack of appreciation or other reason to reap the benefit of mechanical ash handling. Where coal is fed to the stoker by hand, saving in labor cost and flexibility are largely lost.

The smaller stations now turning to mechanical stokers might do well to consider more closely their problem of coal handling, not altogether a simple problem in plants already built, and where it is important to get maximum results with a minimum of outlay. Such plants are often found adopting the steam ash conveyor for removing their ashes by steam instead of by hand because to do so is an inexpensive and convenient method of solving their ash problem. But they still retain manual methods of feeding their mechanical stoker hoppers.

More attention by the smaller power plants to coal and ash handling will bring about a large saving in the aggregate. And it will allow one of the greatest assets of the mechanical stoker to be capitalized, namely, its ability to reduce the labor cost. Just as stokers are now finding their way into plants where a few years ago they were not considered feasible, so too today improved methods of ash and coal handling are available for plants from a hundred horsepower and up. The vast number of small plants scattered about the country that have made some radical change but have gone only a small part of the way—and for this reason are reaping only a small part of the benefit, benefits cumulative in effect—forces the conclusion upon one that those responsible for these plants are not fully conversant with the fuel and labor-saving equipment now available for the small as well as the large plant.

Every Employe a Salesman

"Every employe a salesman" is the doctrine of many wide-awake and progressive central-station companies. And it will be found the closer the progress and success of companies living up to such a doctrine are looked into, the more such a policy, slogan or creed pays. And it pays well.

"Every employe a salesman" means many things. And each one counts. It means that each and every employe in going about his business for the company and also in going about his own affairs on his own time, is a salesman for the company. It means that the gospel of "service" is being propagated wherever the central-station representative goes, in and out of working hours. And this is the age of propaganda. It means that every employe is an advertising medium for selling the idea of "service" to the public, intentionally or otherwise.

"Every employe a salesman" may mean, and it is a meaning that many companies understand in addition to the above mentioned meaning, that employes are actively engaged in acting as salesman for their company in other ways than selling the idea of service to the public. The employe of the central-station company—and other public utilities so far as that goes—usually is respected and somewhat favored by his neighbors. His employer is well known; his job is a steady one and a reputable one. His credit is good and his standing good. To this extent he is respected and privileged.

A man possessing these attributes is well situated to act as a salesman in many ways and of many things. He can boost the use of electrical appliances and he can sell the appliance after he has sold the idea of electric service. As an employe in a steady job, the central-station employe should be able to save and invest in his company's stock. As a stockholder of utility stock he can sell utility stock, with the strong argument that it is good enough for him. He can advocate things electrical—for does he not practice what he preaches? It is surprising the amount of utility stock and the quantity of current-consuming appliances that can be disposed of in this way.

The central-station company that adopts a generous, confidential and mutual policy toward its employes is wise. It is reducing its labor turnover; it is building up a bulwark that is always beneficial and sometimes vital against attack; it is developing an *esprit de corps* that always tends to cement the whole—and those that are divided among themselves cannot stand; it is causing to spring up a vast army of workers, agents, of the company; it is contributing to the efficiency of the entire organization.

The employe counts, and counts heavily. Wise central-station companies are endeavoring to cooperate with their employes in numerous ways to the maximum, not conceding to them a minimum. The employes represent a power, a very great power for good. And the good must be tri-part, good for the company, good for the employes, good for the community.

Current Events

Kansas City Company Reorganized—To Urge Creation of Federal Public Works Department—Canadian Power Status

C., M. & ST. P. ELECTRIFICATION IN WASHINGTON COMPLETED.

Several Electric Locomotives Now in Service on Newly Electrified Divisions to Seattle and Tacoma.

The Chicago, Milwaukee & St. Paul Railroad has entirely completed the construction and installation work on the electrification of that part of its transcontinental line between Othello, Wash., and Seattle and Tacoma, and on Jan. 1 several of its new electric locomotives for these divisions were delivered. All the other locomotives ordered for service on the newly electrified divisions will have been delivered within the next few months.

Since last August the company has had in service two electric locomotives of the freight type as helper engines between Kittitas and Beverly, and two others in similar service between Cedar Falls and Hyak since Nov. 15.

KANSAS CITY CENTRAL-STATION COMPANY REORGANIZED.

No Radical Change Made—Reorganization Effected for Better Financing Large New Generating Station and Expanding Business.

The Kansas City Light & Power Co. of Kansas City, Mo., became the Kansas City Power & Light Co. on Jan. 1. The company under the new title will also embrace the properties of the Standard Electric Light Co., consisting of the Kaw River generating plant and the Rosedale and Mission Hills distribution systems. The real reason for forming a new company, however, is the refinancing that has accompanied the construction of the new company's Northeast power house. The Kansas City Power & Light Co. will have an authorized capital of $20,000,000, of which $10,000,000 will be unissued, $5,000,000 held as treasury stock and $5,000,000 deposited with trustees for the holders of certificates representing stock in the old companies. The indebtedness of the power and light corporation is about $15,000,000 with $3,000,000 in additional first and collateral trust notes in the hands of trustees subject to call for extensions and improvements in 1920. The "used and useful" investment upon which the Missouri Public Utilities Commission figures rates is now $18,000,000. All of the present directors and officers will retain their positions and titles in the new corporation.

In 1919 the Kansas City Light & Power Co. has operated at a slight loss, but President J. W. Porter states there is no doubt in his mind but that the new power plant, with its many advantages and economies, will place the company in a position where a reasonable revenue and return upon invested capital will be earned.

NATIONAL PUBLIC WORKS DEPARTMENT ASSOCIATION CONVENTION.

Second Annual Meeting to Be Held in Washington to Further Federal Department of Public Works.

The second convention of the National Department of Public Works Association will be held in Washington at the New Willard Hotel on Jan. 13 and 14. Invitations to all engineering and technical societies and to many business, civic and national organizations have been sent to attend this convention. A large attendance is expected from each section of the county.

The purpose of the convention is to have a general experience meeting concerning ways and means of best carrying on the campaign for the enactment of this legislation, to discover what have been the particular difficulties in the way and to learn from the experience of the campaign managers the best methods of meeting these difficulties.

The campaign for the creation of a national department of public works was authorized at a conference held in Chicago last April and in the early summer a start was made towards perfecting a national organization to carry on this work. As a result, there are now campaign organizations at work in almost every state. Practically every enginering society has endorsed this measure as have many business organizations and groups. The engineers, architects and constructors of the country started this measure but soon realized that its appeal was to all associations and groups interested in an economical administration of Government affairs and therefore its name has been changed from the Engineers', Architects' and Constructors' Conference on National Public Works to the National Public Works Department Association.

A very encouraging number of congressmen and senators have been favorably impressed with this measure and during the progress of the convention, time will be allotted to each state delegation to call on its senators and representatives and discuss the situation with them.

Congressman Frank C. Reavis, who introduced the measure in the House of Representatives, will address the convention on "Practical Results to Be Achieved by a Department of Public Works," and Gen. R. C. Marshall, chief of the Construction Division, will discuss "Practical Economies Secured by Standardization of Specifications." The meeting will be held in the ball room on the tenth floor of the Willard

Hotel. Full information can be secured and hotel reservations made by addressing the secretary, National Public Works Department Association, McLachlen building, Washington, D. C.

WESTERN ELECTRICAL INSPECTORS' CONVENTION PLANS PROGRESSING.

Extracts From Secretary Boyd's Progress Report on the Coming Fifteenth Annual Meeting in St. Louis.

In our issue of Dec. 20, 1919, was given the general program for the forthcoming annual convention of the Western Association of Electrical Inspectors. Secretary W. S. Boyd, 175 West Jackson boulevard, Chicago, has sent out the following supplementary information relative to this convention:

"Electrical inspectors generally will rejoice to know that the Western Association of Electrical Inspectors announces the receipt of acceptances from men prominent in the electrical industry invited to discuss methods of making electricity safe, before the fifteenth annual meeting to be held at Planters Hotel, St. Louis, Mo., Jan. 27, 28 and 29.

"No one interested in these matters can afford to miss this meeting and every one having something to contribute along this line should be willing to lend every assistance possible in bringing into bold relief the reason that the safest form in which energy may be distributed for producing light, heat and power has become such a great destroyer of life and property so that steps may be taken to mitigate this evil and finally overcome it. In cities where this problem has been grappled with intelligently fires and accidents have been reduced to a nominal amount and it is only fair to state that the average electrical inspector has done much good work along this line where given opportunity, but with the advice and support of the industry he can multiply his effectiveness in this respect and establish practically 100% safety."

Mr. Boyd's foregoing remarks are modest in giving credit to the electrical inspectors for much of the advance in safety electrical construction that has been attained. All fully conversant with the electrical industry recognize that the inspectors have taken a very prominent part in reducing electrical hazards and thereby greatly extending the popularity of electric service. We are assured that the inspectors will be glad to receive more generous assistance and co-operation from other branches of the industry and the coming convention will be an excellent opportunity to put this into effect.

GENERAL HARRIES ADDRESSES NEW YORK ELECTRICAL LEAGUE.

Expects Keen Industrial Competition by Germany—Requests American Manufacturers Make Preparation to Meet It.

The regular monthly luncheon of the New York Electrical League was held Dec. 16 at the Hotel McAlpin, New York City, and Brig.-Gen. George H. Harries addressed about 250 members and guests. General Harries was head of the American Military Mission to Berlin and has had a long career in the army.

He sounded a note of warning at the beginning of his address by calling attention to the present state of unpreparedness in this country and pointed out that in a military sense we are no better off now than we were before the war and that no apparent efforts are being made to correct this condition. He strongly urged a system of universal training and denounced the idea of a small regular army supplemented by a national guard as inadequate and inefficient.

Going on to discuss the signing of the armistice, which in his opinion was ill-advised, he pointed out that had the Allies continued their assaults on the already weakened German forces we could have dictated a peace which would have proved conclusively to the German people that theirs was a beaten army, a thing which the armistice as signed did not do. The present unrest and disturbances in Germany and Russia would have been eliminated by an army of occupation which would give us at the present time a Germany at peace and productive under Allied military rule. The general likened our action in signing the armistice to a man who having invested $995,000 in a business, refuses to put in $5000 more to protect his original investment.

He told of the origin and development of the Spartacist movement in Germany and related its subsequent check through the efforts of a body of men, most of whom were former officers in the German army. He predicted that in the coming elections in Germany next month these men by whose efforts Spartacism was checked would reap their reward by receiving the reins of the government from the hands of the people. It is the general's belief that there is in the German people the capacity for good though not democratic government, and he predicts a return to a partial autocracy with either Hindenburg or Ludendorf at its head, giving as his opinion that while Hindenburg holds the esteem of the people, Ludendorf commands their respect, which to the German mind is a greater factor in leadership.

General Harries concluded his address with a plea to American manufacturers to prepare for the keen competition that will inevitably come when Germany has a stable government. It is his opinion that this competition will undoubtedly be renewed with all the far famed German efficiency and urges that we make the most of our head start to meet it.

CANADA'S WATER HERITAGE AND ELECTRIC POWER.

May Lead World in Power Production by Vast Water Powers Now Running to Waste.

Speaking at the twelfth annual convention of the Canadian Gas Association, Arthur V. White, Commissioner of Conservation of Canada, pointed out that, notwithstanding her immense water powers, Canada could not do without other forms of energy, chemical energy of fuels.

In part he said: "Canada, it is true, is richly endowed with water powers, but she can never depend upon this asset as a sole source of heat. We have about 19,000,000 estimated 24-hour

low-water horsepower, of which less than 2,500,000 horsepower has been developed. By no means may all the water powers be economically developed.

"For many years past I have been emphasizing the comparatively limited use which can be made of electric energy as a wholesale substitute for coal for heating—including the heating of buildings. There is no use whatever entertaining hope that hydroelectric energy as a heating agent may become an adequate substitute for coal for the citizens of Canada and consequently a realization of this fact will facilitate the concentration of effort upon sources from which real relief may be derived."

When the new Chippawa Canal is completed it will provide Canada within the next five years with a total of 2,000,000 horsepower. This, it is expected, will be increased to 10,000,000 horsepower within ten years, making Canada the leading country in the world in the amount of hydro power.

COAL UNDER ALLEGHENY RIVER BED TO BE MINED.

Interesting Experiments Now Under Way for Lifting Coal from Mine to Power Plant.

The West Penn Power Co. has under construction at Springfield, Pa., a generating station that will cost in the neighborhood of $6,000,000 when completed. This plant is adjacent to the Allegheny river, in the bed of which lies a large quantity of coal, which it is intended shall be used by the plant now building.

A vertical shaft from the ground level to the vein of coal underlying the bed of the Allegheny river has been sunk to a depth of 150 ft., and preparatory to tunneling under the river through the vein, cofferdams have been built in the river to provide for the water supply system.

The coal supply for the big power plant will be derived from the vein of coal underlying the river bed and extending far beyond underneath the opposite shore. Company officials expect that approximately 1,000,000 acres of coal land will be mined before the supply is exhausted.

SEATTLE SECTION, A. I. E. E., DISCUSSES RADIO WORK.

The Seattle Section of the American Institute of Electrical Engineers held an interesting meeting and election of officers on Dec. 16. Reports were presented by the officers and chairmen of committees and after the main program the election of officers took place, at which G. E. Quinan was elected chairman and Willis T. Batcheller secretary-treasurer.

The subject of discussion for the evening was "Radio Engineering in the Thirteenth Naval District" and was presented jointly by R. H. Marriott and H. H. Lester of the Bremerton Naval Station Radio Laboratory. Dr. Lester outlined the scope of the work done by this district, explained the fundamental principles and circuits and showing the desirability of the new transpacific wireless route from Keyport to Vladivostok via St. Paul's Island on the coast of Alaska. This route is about 2700 miles long, as compared to about 7000 miles between San Francisco and the Philippines via Honolulu.

Mr. Marriott gave a description of a method invented by him for guiding ships into narrow, crooked channels, and gave a demonstration with experimental apparatus. This method consisted of passing a small alternating current through a cable laid along the desired course in the channel and determining its location by means of induction in a coil of 2000 turns of wire arranged so as to be adjustable. The coil is turned until the maximum induction is obtained, as determined by means of head telephones, when it points toward the cable. To the question as to what current was used in the tests which Mr. Marriott had made, he replied 0.7 ampere, which was the maximum amount possible with 40 volts, the rating of the cable used.

Mr. Jefferson, of the Kilbourne & Clark Manufacturing Co., maker of radio apparatus, had a 0.25-kw. radio set of the commercial type on exhibition and gave a demonstration, bringing out in his discussion the simplicity and ruggedness of the apparatus.

COMING CONVENTIONS.

American Institute of Consulting Engineers. Annual meeting, New York City, Jan. 19. Secretary, F. A. Molitor, 35 Nassau street, New York City.

American Society of Civil Engineers. Annual meeting, New York City, Jan. 21-22. Secretary, Charles W. Hunt, 33 West 39th street, New York City.

Western Association of Electrical Inspectors. Annual convention, St. Louis, Mo., Jan. 27-29. Secretary, W. S. Boyd, 175 West Jackson boulevard, Chicago, Ill.

Material Handling Machinery Manufacturers' Association. Annual convention, New York City, Jan. 29-30. Secretary and manager, Zenas W. Carter, 35 West 39th street, New York City.

United States Independent Telephone Association. Annual convention, Atlanta, Ga., Feb. 4-6. Secretary-treasurer, W. S. Vivian, 19 South La Salle street, Chicago.

National Council of Lighting Fixture Manufacturers. Annual convention, Detroit, Mich., Feb. 9-13. Secretary-treasurer, Charles H. Hofrichter, Cleveland, O.

Oklahoma Utilities Association. Annual convention, Oklahoma City, Feb. 10-13. Secretary, H. A. Lane, 611 State National Bank building, Oklahoma City.

Central Electric Railway Association. Annual meeting, Louisville, Ky., Feb. 26-27. Secretary, A. L. Neereamer, Indianapolis, Ind.

American Electrochemical Society. Annual convention, Boston, Mass., April 7-10. Friday, April 9, joint session with American Institute of Electrical Engineers on "Electrically Produced Alloys." Secretary, Joseph W. Richards, Bethlehem, Pa.

National Electric Light Association. Annual convention, Pasadena, Cal., May 18-21. Headquarters, Hotel Huntington. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

National Association of Electrical Contractors and Dealers. Annual convention, Baltimore, Md., Oct. 6. Secretary, W. H. Morton, 110 West 40th street, New York City.

Commercial Practice

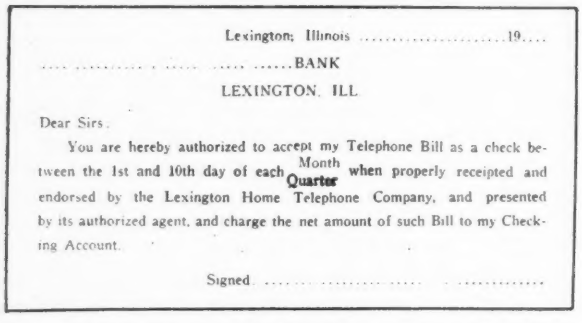
Utility Bill Paid by Draft on Bank — Important Ruling Rendered by Illinois Supreme Court — Utility Activities

DRAFT ON BANK PAYS TELEPHONE BILL.

Interesting Practice Developed by Lexington Home Telephone Co. for Payment of Telephone Bills.

A scheme of collecting telephone bills through the banks has been adopted by L. F. Hyneman, manager of the Lexington Home Telephone Co., Lexington, Ill. The scheme, in effect, is equivalent to using the telephone bill as a check or draft upon the bank of the customer. The telephone company presents the telephone bill to the bank, which pays the telephone company as per sight draft.

The telephone subscriber or party having the telephone signs an authorization card, one of



Lexington, Illinois .....19....

.....BANK

LEXINGTON, ILL

Dear Sirs:

You are hereby authorized to accept my Telephone Bill as a check between the 1st and 10th day of each Month / Quarter when properly receipted and endorsed by the Lexington Home Telephone Company, and presented by its authorized agent, and charge the net amount of such Bill to my Checking Account.

Signed .....

Card Used by Illinois Telephone Co. In Connection With Its Scheme of Collecting Telephone Bills Through the Banks.

which is reproduced herewith. This gives authorization to the bank to pay the amount presented by the telephone company during the first ten days of the month. In this way much time has been saved, payments for telephone service are promptly met, and it is claimed very satisfactory results in every way have been obtained.

ONE CENTRAL-STATION COMPANY REPLACES 250,000 LABORERS.

Central-Station Effort in Human Equivalent Interestingly Brought Out.

At a recent gathering, Donald McDonald, vice-president and general manager, Louisville Gas & Electric Co., Louisville, Ky., made some very interesting comparisons between central-station service and human effort. In part, he said as follows:

"The most interesting topic that I know of for discussion by intelligent people is undoubtedly the servant question. I am going to tell you about a servant that I know.

"She does all the cooking, washing, ironing, and cleaning for a family of five. She brings in the fuel, splits the kindling, lights the fire, cleans and tends to the lamps, and when she is not busy otherwise, she turns the machine on which the breadwinner of the family makes his living. She never complains about the amount of her work; on the contrary, she is constantly saying that she would like to have more to do. She does not carry a basket home at night. Her wages are $1 a week, and she is perfectly contented with them. She works for the Average Family, who live on Every Street, in Louisville. Her name is the Louisville Gas and Electric Company. She is what is called a Public Servant.

"Seriously, my friends, I have made a careful calculation and I find that it would require 250,000 able and willing slaves to do the work in this city which is done by this company. In order to be as economical as the present service, these slaves would have to work without wages, to wear no clothes, and to satisfy their appetites with $1 worth of food each week.

"Of course, servants should always display humility, they should never grumble about the amount of work they have to do; but when the servant is willing and anxious to do more work, no one should grudge her the privilege of bragging about the amount of work that she is already doing. Also a servant should not be spoiled. It seems to be good for them to reprimand them occasionally, but when they do well, an occasional kind word undoubtedly improves their disposition and makes their work better."

ILLINOIS SUPREME COURT UPHOLDS UTILITY COMMISSION REGULATION.

Many Controversial Points Apparently Cleared Up by Decisions in the Quincy Traction and Springfield Gas Decisions.

Two recent unanimous decisions by the Illinois Supreme Court seem to be of far-reaching importance in relation to the regulation of public utility companies and the fixing of their rates for service.

In the Quincy traction case decision, the Court holds unequivocally that the powers of the Public Utilities Commission supersede all of the rate regulating powers ever granted to municipalities in Illinois. So-called "contract ordinances" or other forms of rate contracts between municipalities and utility companies are of no avail, the court says, because municipal authorities in Illinois have never been clothed with power to make binding contracts fixing rates for a definite term of years, and without this specific and definite power municipalities could not make

binding contracts under the general rate-regulating powers delegated to them by the legislature prior to creation of the Public Utilities Commission. The United States Supreme Court is quoted at length in support of this finding. The net result is, the Court holds, that the Public Utilities Commission has full power to change any public utility service rate in Illinois hitherto fixed by the local authorities.

In the Springfield gas case decision, the Supreme Court covers a wide field in discussing utility company rates and the valuation of utility company property for rate-making purposes. Among the high spots of the decision are the following:

"Going value" is always present and is one of the elements that *must* be taken into account in the valuation of a public utility. One of the main reasons for sending the Springfield case back to the Public Utilities Commission for further consideration was that the Commission had not given sufficient weight to going value.

The decision discusses at length the elements to be considered in fixing rates and makes it a prime duty of the public Utilities Commission to see that rates are just and reasonable. But the fact that a rate is non-confiscatory does not mean that it is "just and reasonable."

"The real test of the justice and reasonableness of any rate," the Court says, "seems to be that it should be as low as possible and yet sufficient to induce the investment of capital in the business and its continuance therein."

"An unwise administration of regulatory laws," the Court adds, "will drive capital from this field and bring on public calamity by causing the utilities to cease to function. It is equally important to the public and the utility that the rates established be just and reasonable.

"A just and reasonable rate, therefore, is necessarily a question of sound business judgment rather than one of legal formula, and must often be tentative since exact results cannot be foretold." In other words, it would seem to be the Court's reasoning that the Public Utilities Commission should allow a utility company some latitude in its rates for meeting contingencies (as fluctuating costs of material and labor, changing conditions affecting its business, and so on) rather than tie it hand and foot to arbitrary standards. For the Court goes on to emphasize this point:

While the Commission should apply business judgment and discretion in fixing utility companies' rates, yet "the Commission cannot substitute its own business discretion or judgment for that of the directors of the corporation," lest business initiative and enterprise be discouraged. In such cases, the Court says, the Commission "should move with caution."

ENGLISH THEATER TO BE HEATED ENTIRELY BY ELECTRICITY.

Hammersmith Theater to Have Proud Distinction of Being First Electrically Heated Theater.

It is reported that the Lyric Theater, Hammersmith, London, is to be equipped throughout for electric heating. So far as is known, this will be the first theater to depend entirely upon electricity for heat. Electricity will be supplied by the local municipal or borough station.

The decision to adopt electric heating was made after taking into due consideration the present high price of coal in the British Isles. Another factor that contributed considerably to the choice was that electric heaters, installed, were found to be considerably less than that of other methods of heating. It is a well known fact that the large number of small utility power plants in England result in higher operating costs than is the case this side of the ocean. It is hoped that theaters within reach of some of our many water powers will follow suit, and take to electric heating also.

From the same source comes the news that electric heating is to be employed by the Lossiemouth School, a large school in Scotland. Estimates for carrying out the scheme show that the equipment will cost in the neighborhood of $8000.

AN ELECTRICAL CHRISTMAS ADVERTISED TO WALL STREET.

Central-station service extends in practically every direction, and in consequence central-station publicity follows its lead. With the assurance that those in the financial world offered a productive field for the sale of electrical appliances for gift-making purposes, the New York Edison Co. recently inserted a page advertisement in the *Wall Street Journal,* a reproduction of which is given. The arrangement of the advertisement is unusual, the pen-and-ink sketches serving to indicate the use of the many appliances suitable for gifts.

Give Something Electrical This Year!

The New York Edison Company
At Your Service

Central-Station Advertisement Showing Utility of Electrical Christmas Gifts.

Operating Practice

Automatic Induction-Generator Hydraulic Station—Ammeter Calibration on 4000-2300 Volt Feeders

AUTOMATIC INDUCTION GENERATOR HYDRAULIC PLANT OPERATION.

Interesting Experience and Operating Costs of Greenfield Light & Power Co.'s Plant.

The Greenfield Light & Power Co. owns a 100-hp. induction generator hydroelectric plant located on the Green river which is operated by the Turners Falls Power Co. under the supervision of C. F. Mosher. This plant has been in operation since 1913, and is located at Greenfield, Mass.

There is a watershed above the dam with an area of approximately 50 square miles. The dam itself is a concrete gravity type ogee section, with a spillway 164 ft. long, creating a head of 8½ ft. from its crest to tail water. This is increased to 11½ ft. by means of flashboards during the season.

The wheels are two in number, set in an open flume in a common horizontal shaft.

The original installation consisted of two 100-hp., 3-phase, 60-cycle, 2300-volt squirrel-cage induction motors belted to the main shaft in a separate room adjoining the wheel chamber. The switching installation consists of a single panel mounting an ammeter, a watthour meter and an automatic oil switch connecting the motor to one of the company's distribution circuits adjacent to the plant.

A hydraulic relay governor is installed to control the no-load speed of the unit to about 15% above normal. G. E. equipment was used throughout.

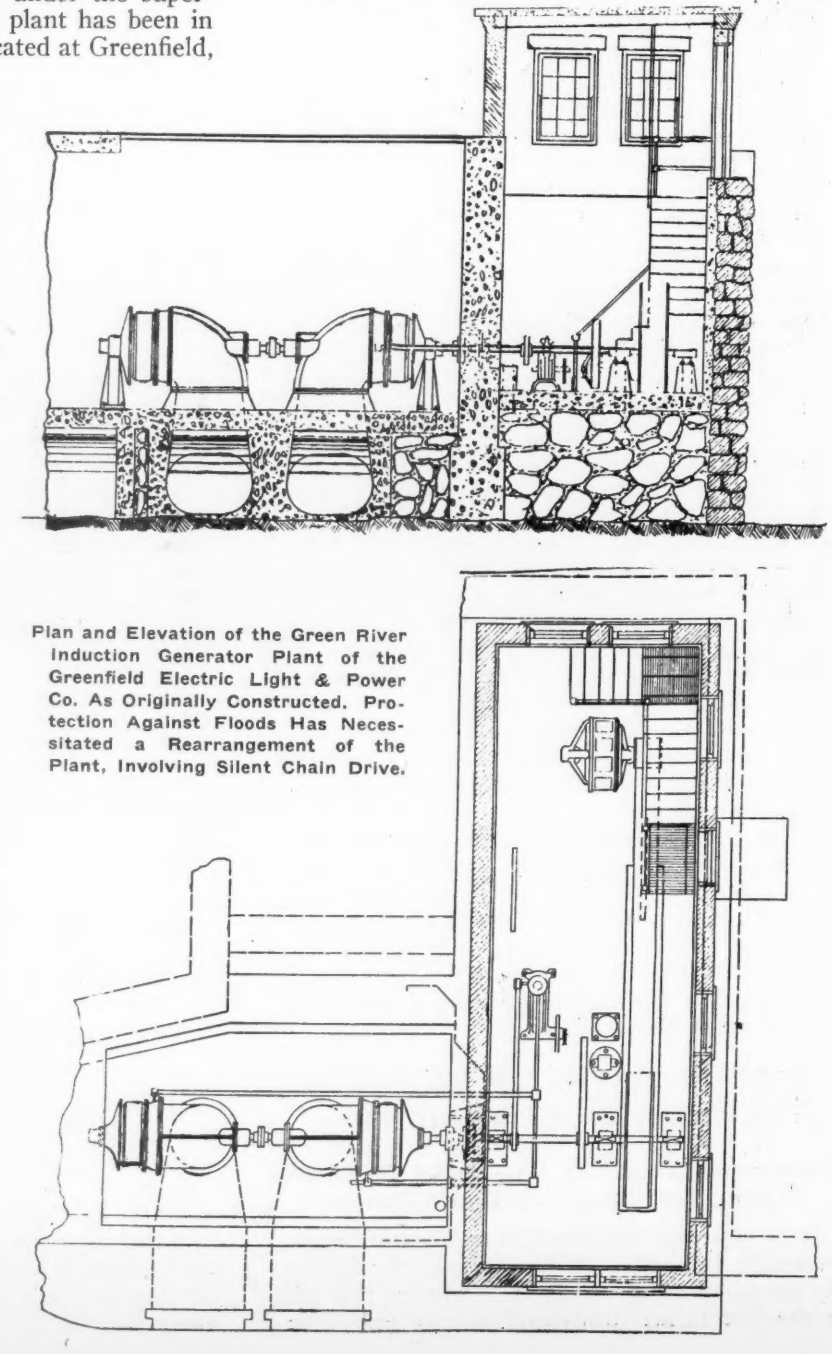
The generator room is so low and the river rises so rapidly at times that trouble was experienced in the belt pit and once in the room itself, causing such serious belt troubles that in 1916 the motor was reset at a higher elevation and a silent chain drive substituted for the former belt drive. Since then no further trouble has occurred.

The total plant investment is $26,143.80, divided as follows:

Land and water rights	$ 3,000.00
Dam	13,019.31
Building foundations and wheel chamber	5,354.15
Electrical and hydraulic equipment	4,770.34

The repair and maintenance cost has been as follows:

1914	$ 61.85
1915	332.98



Plan and Elevation of the Green River Induction Generator Plant of the Greenfield Electric Light & Power Co. As Originally Constructed. Protection Against Floods Has Necessitated a Rearrangement of the Plant, Involving Silent Chain Drive.

1916	358.44
1917	86.35
1918	101.17

a total of $940.69 for the five years, or 9325 mills per kw-hr.

No operating labor is charged to this plant, for it is located about ⅛ of a mile from the company's steam plant and the only regular attendance given is a visit three times daily from one of the steam plant operators on his way from or to work. On this visit an inspection of bearings, racks, etc., is made, and if necessary, racks raked or the outfit started up or shut down, as may be indicated by the water conditions.

Most of the repair and maintenance expense consists of flashboard maintenance, these having to be replaced complete once each year. The higher costs for 1915 and 1916 were due to necessary belt repairs and to replacing of belt with silent chain, as referred to before.

It will be seen that if fixed charges of 15% per annum for the equipment and 10% per annum for the remaining investment is charged against the output the statement would be as follows, assuming an average annual output of 200,000 kw-hrs. and an average annual repair and maintenance charge of $200:

15% .....$4770.34—$715.55
10% .....21369.46—2136.95

2852.50 305250

$\frac{305250}{200000}$ = $1.52 per kw-hr.

Repairs & Maintenance 200.00 200000

Total.....$3052.50

The answer in this particular case is this: An old log dam and grist mill occupied this location for years and from the pond above the dam the company obtained the absolutely necessary condensing water for its steam plant. In the course of years the grist mill was abandoned and the log dam became dilapidated beyond repair, so that the company, to protect its condensing water supply, found it necessary to purchase the property and build a new concrete dam. Under these circumstances there is chargeable against this hydroelectric plant output only the maintenance charges and fixed charges on the buildings, foundations and wheel chambers and equipment, so the statement becomes as follows:

15% .....$4770.34—$715.55
10% ..... 5354.15— 535.42

1250.97 145097

$\frac{145097}{200000}$ = .0725 per kw-hr.

Repairs & maintenance 200.00 200000

Total.....$1450.97

It would seem to be apparent from the above that the above method of utilizing a small power for the particular case under discussion has been a commercially feasible proposition, but it would seem equally apparent from the figures given above that this installation would not carry itself as a commercial proposition if fixed charges on the entire cost of development were charged against the output, on the basis of $7.00 coal.

AMMETERS IN EXCESS OF CIRCUIT RATING FOUND ADVISABLE.

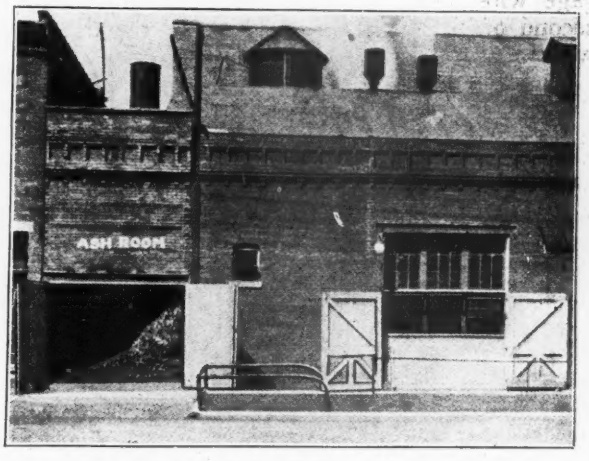
The Commonwealth Edison Co. operates a very extensive distribution network of four-wire, three-phase circuits. The potential is 4000 volts delta and 2300 volts star. The neutral is grounded at one place, that is at the station. The company uses but two sizes of wire, No. 0 and No. 6. Much of the conductor is placed underground, two-wire and four-wire cables being employed, according to whether it is single or three-phase that is being supplied.

The normal full load current per phase is 150 amperes, for which the induction regulators in the stations are designed, they having a rating of 36 kv-a. The Commonwealth Edison Co. has found that circuits may safely operate at 160 amperes continuously even with the regulators in the full boost position and at 200 amperes for several hours. The company has recently, therefore, changed the calibration of all 4000/2300-volt feeder ammeters for 175 amperes full scale reading instead of 150 amperes as they were originally.

With full scale deflection of 150 amperes, many feeders carried loads of 175 amperes and less, but the station operators were unable to determine how much in excess of the nominal full load of 150 amperes. With full scale of 175 amperes, much of this confusion has been done away with and more accurate station records can not be obtained.

CENTRAL STATION USES ALLEY AS STORAGE BIN FOR ASHES.

The Laporte Gas & Electric Co., Laporte, Ind., has a total of 2450 boiler hp. in its station, this capacity being composed of seven Stirling boilers supplied by Murphy and Detroit stokers. During the 24 hours the plant consumes about 40 tons of coal, and in doing so produces approximately 10 tons of ashes.



Alley Used as Ash Storage Bin in Connection With Steam Ash Conveyor by Laporte Gas & Electric Co.

The company uses an American steam jet ash conveyor for handling the 10 tons of ashes, the only work in connection with which is to shovel the ashes to the conveyor and to turn on the steam when sufficient non-combustible has collected. A short alley between buildings exists and this is being used by the company as an ash storage bin. Local teams take the ashes away free of charge for use as filling. The Laporte Gas & Electric Co. considers that it has solved its ash-handling troubles, and very cheaply.

Contracting-Construction

Peculiar Hazard Accompanying Operation of Amateur Wireless Stations—Wiring Momentary-Contact Switches

INVESTIGATION OF FIRE IN PRIVATE RADIO STATION.

A New Problem in Electrical Fire Hazards—Paper Read Before Western New England Section, National Association of Electrical Inspectors.

By Thomas Henry Day.

The writer was recently invited to investigate the cause of a small fire, which was confined to a lighting fixture, in a residence in which a radio apparatus was being operated. The result of such investigation leads to the question, "Have we a new hazard and, if so, how may it be removed or guarded against?"

Electrical Equipment.—The range and capacity of many privately owned and operated radio stations have been greatly increased since the ban prohibiting their use (a war measure) has been removed. Most of these stations are located in private dwellings which are equipped with combination gas and electric lighting fixtures, the electric lighting equipment being connected to a 110-volt alternating-current system which system is grounded. The fixtures in the station in which this fire occurred are wired with No. 18 B. & S. gage wire having an insulation of one thirty-second of an inch of rubber and were installed with insulating joints of an *approved* make.

The sending set of the radio equipment draws its energy from the lighting system, there being the required transformer and usual "kick back" protection without condensers. The equipment is on the third floor and the "lead" from the radio equipment to the antenna parallels some of the circuit wires of the lighting system, the "lead" to the antenna, however, being on the outside of the dwelling, which is of frame construction.

Static Discharges.—When the sending side of this station was in operation, a current of 1.6 amperes was being used. This station, in common with others, has been in operation since Oct. 1, since which date the evidence of static discharges has been noticeable throughout the several apartments of the house in the plumbing fixtures, lighting fixtures, water, oil and gas pipes, also the telephones of both of the tenants, the latter to such a marked degree as often to render them useless, because of the intense noise in the receiver when the radio equipment was in use. The circuit fuses of the lighting system have been blown and were finally increased to 25 amperes.

In a one-light fixture located about 15 ft. from the radio equipment, but not in the same room, the static discharge was extremely pronounced and, when the radio equipment was being operated on the morning of Nov. 16, there was "a brilliant flash," which upon examination proved to be an arc in the canopy of the fixture, the arc having ignited the insulation on the wires and melting a hole, ⅞ in. in diameter in the canopy, which was the extent of the damage and for which no claim was made by the assured. The assured stated that he had noticed "a red discoloration on the canopy after the static discharges began."

What the Investigation Revealed.—The lighting fixtures were installed about 12 years ago. A test made by the writer of the insulated joint showed that the insulation between the grounded and ungrounded sides had not been impaired. An insulation breakdown had occurred on the ungrounded circuit wire of the lighting system at the point where the wires entered the slotted opening in the sheathing tube. The sharp edge of this slot, however, shows no evidence of an arc; the locknut, which holds the sheathing tube in position, shows a small globule of copper. The ungrounded circuit wire was in contact with the fixture at this point, which was the ungrounded side of the insulating joint, the entire fixture being at a potential opposite to that of the ground.

An arc occurred between the canopy and the insulated part of the insulating joint, melting a hole, ½ in. in depth, in the insulating compound to the grounded side of the insulating joint, the capacity of the arc being sufficient to blow a 25-ampere fuse. As a result of tests made at the time of the investigation with the sending set of the radio equipment in operation, it seemed that the wiring equipment of the house was subjected to an induced voltage of about 5000 in addition to the line voltage.

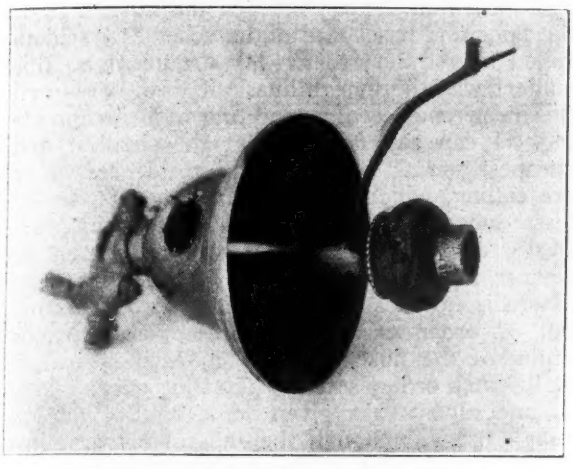
A Similar Experience.—When engaged in the investigation of this fire, the writer was told of a privately owned and operated radio station in Eastern Massachusetts, where its owner had had similar experiences with the static discharges, the fixtures and fuses breaking down throughout his home whenever he used a current of 2 amperes on his antenna. This station, however, has not been visited by the writer.

The Problem.—All concerned have agreed that part of the difficulty which contributed to the fire was due to the overfusing of the circuit wires of the lighting system, but this is not the entire problem. This experience is new to the writer; it is also new to the owner of this radio station, who is a gentleman considered as being an expert in the science of radio apparatus. In view of this new experience the writer hesitates to offer a solution, but the problem is worthy of attention and study, at least along the following lines:

(a) Would it not be wise so reword the pres-

ent rules that the use of insulating joints will not be permitted in buildings having radio stations or electric lighting fixtures? The wiring of such fixture to be with conductors having a rubber insulation of at least 3/64 in. of rubber.

(b) Would it not be a good provision in the rules to provide for the installation of some device which will drain the ungrounded wire of the lighting system of the induced current before such induced current reaches a dangerous voltage? Should such a device be possible, will it safeguard the lighting system of the same secondary systems in buildings relatively close to



View of Fixture Showing Holes Burned in Canopy and Insulating Joint.

the radio station? If not, would it then appear practical to suggest that radio stations drawing their energy from a public serving company be connected to an independent transformer?

(c) It has been felt, more especially since the ban has been removed, that the present rules are not adequate to meet and to provide for the experience gained in this science during the war. Would it not be wise to rewrite this rule?

(d) There appears to be still another thought in this problem. How much does the paralleling of the lead to the antenna or the antenna itself with the circuit wires of the lighting system contribute to the cause of this and similar experiences?

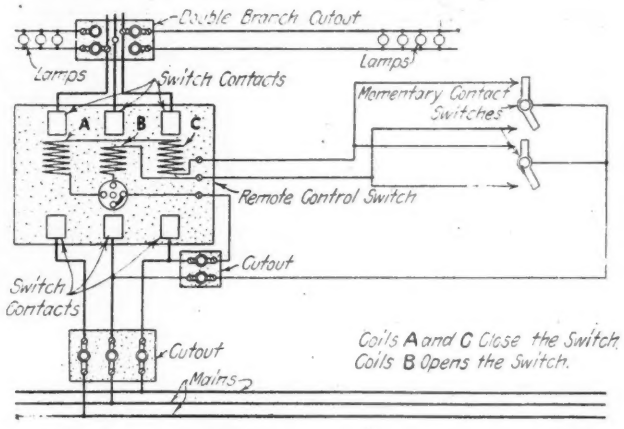
ARRANGEMENT OF MOMENTARY-CONTACT SWITCHES.

For Controlling Lamps or Other Apparatus from a Point Distant from That at Which Apparatus Is Located.

By H. L. Bristol.

Momentary-contact switches are shown at *M* in the accompanying illustration. They are used for momentarily actuating the control magnets of a remote-control switch of some type or other. The circuits and the operation of the remote-control switches and momentary-contact switches will be apparent from the study of the circuit diagram.

When the button of a momentary-contact switch (these switches are usually of the flush push-button type) is pressed, it closes only momentarily the circuit in which it is connected. Then a spring in the switch pulls the contact arm out of connection with the contact point. In other words, with one of these switches it is not possible to effect a continuous contact. By pressing the upper button of either of the momentary-contact switches current is permitted to flow momentarily through the remote-control switch coils *C* and *A* and energizes them. This closes the remote-control switch. Then by pressing the lower button of either of the momentary-contact switches, the coil *B* is energized, which opens the switch by using the arrangement diagrammed. Incandescent lamps or other apparatus can be controlled at a point distant from that at which



Circuits of Remote-Control Switch Operated by Two Momentary-Contact Switches.

the apparatus is located. Obviously, there may be as many momentary-contact switches, installed at different locations in the building, as may be desirable.

RAIL AND STREET-CAR STATION INDICATOR FOR LONDON.

The London Metropolitan Railroad has arranged to put into operation on its system an electrical device whereby the names of stations are indicated in the passenger cars. The system is operated by illuminating sections of the ceilings of each compartment, arranged in panels, each of which in turn becomes prominently lighted up as the journey proceeds. At the commencement of the journey the next station becomes so indicated; when that point has been left, the section or panel applying to it becomes dull, but the next becomes illuminated. Before starting a journey the motorman actuates a series of switches and the rest of the action is automatic, the mechanism being operated by a small striker on the track between the stations. In addition to the names of the stations, it is intended to show a map of a square mile of streets around each spot, giving the chief shopping centers and the leading places of amusement.

This indicator is to be put into operation first on the Great Northern tube railroad and gradually extended to others. It is also proposed to try the plan on part of the street-car routes. The indicator will, it is claimed, enable passengers and travelers to become easily acquainted with their whereabouts, resulting in convenience, reducing congestion and saving time.

QUESTIONS AND ANSWERS

All readers are invited to submit questions and answers to this department. Anonymous communications will not be considered. Questions should relate to electrical matters of any kind. Answers contributed by readers should be submitted preferably within eight days of the date of publication of the question and should be limited, if possible, to 300 words. Payment will be made for all answers published.

Questions.

No. 475.—Pricing Motor Repair Work.—Can some of the readers through the questions and answers columns give me the best methods of pricing repair work on electric motors, armature winding, etc., and the best methods of setting the selling price of insulating materials and of magnet wire?—D. D., Indianapolis, Ind.

No. 479.—Boiler-Furnace Explosions.—I would like to know if anyone has had similar experiences to mine. We find since burning bituminous run-of-mine, that the fire door is often blown open with considerable force. At other times when the fire door is opened an explosion occurs and flame and coal is ejected into the boiler room. Just what are the causes of this, and how may they be overcome without changing the grade of coal?—J. R. K., Belvidere, Ill.

No. 480.—Depreciation Reserve of Utilities.—What is the present prevailing practice on the part of public service commissions as to how the depreciation reserve of public utilities shall be kept? Is this fund always kept separate and distinct from other sinking funds or reserves? Do the commissions approve lumping it in with the general reserve of the utility? A. E. M., Little Rock, Ark.

No. 481.—Installing Lead-Covered Cable.—We anticipate installing about forty lead-covered three-phase cables in a building. These cables enter from underground to the basement and then are routed upward at one end where they pass to a switchboard for distribution. It seems that the usual method of bringing in lead-covered cables along the floor and covering them with cement is not only troublesome at time of installation, but creates needless difficulty if ever cable repairs become necessary. Would some one familiar with this form of work give some information as to a cheaper and more convenient way of installing these conductors?—C. M., Kansas City, Mo.

No. 482.—Cleaning Power-House Condensers.—What routine methods are usually employed for cleaning condenser tubes? We find that the dirt in our tubes changes at different times of the year, sometimes causing a hard brittle scale, at other times forming a slimy mass, like vaseline. How can this condition be overcome? What methods of cleaning are usually used?—J. M. McN., Tacoma, Wash.

Answers.

No. 477.—Floor Outlets in Living Rooms.—I should like to have the statements of readers as to their practice in wiring large living rooms in residences where several floor and table lamps are likely to be used and no ceiling fixtures are specified. In a particular case of this sort the architect called for six bracket fixtures and no wall or floor receptacles. I pointed out to him that on account of the size of the room (18 ft. by 22 ft. 6 ins.) any table or floor lamps would require long cords to reach the brackets unless these lamps were used quite close to the wall, in which case the lighting of the center of the room would be poor. Such long cords and few outlets would cause trouble. Therefore I recommended adding at least two floor receptacles and four baseboard receptacles. The architect objected to floor outlets as too likely to cause trouble. Was my recommendation in accord with the best practice in such cases? Has any serious objection been found to floor outlets?—J. O. B., Pittsburgh, Pa.

Answer A.—I was engaged in the electrical contracting business in the city of Pittsburgh for 25 years yet I cannot recall a single instance of an objection on the part of any architect in the city during that time in connection with either wall or floor outlets for electric lighting, regardless as to the ceiling or bracket outlets already provided for. I used wall and floor outlets as far back as 1895, first the open type, then adopting the closed-shutter type as soon as introduced. I will say that if such items were omitted on the plans and specifications in large rooms in residences or office buildings I made it a particular point to reach either the architect or the owner and show him the convenience and advantage of the floor and baseboard outlet scheme; I seldom failed to get the order. My argument on this subject was the unsightliness of drop cords and the inconvenience of connecting and disconnecting. I can say further that the smallest and cheapest wiring jobs in small residences today are calling, which is most advantageous, for at least one outlet in baseboard or floor in practically every room to take care of a vacuum cleaner and a heater in case of fuel shortage. There is no occasion for trouble or for getting out of order with a good receptacle or floor outlet of the flush type any more than with a wall switch or key socket. The plug part is likely to and always has given some trouble due to rough usage, although the separable type eliminates considerable of this and the manufacturer who uses same is fully repaid for the bettered service derived therefrom. I will admit that there is too frequently trouble at the point of attachment of the electrical appliances, but as stated above, this is the fault of the common and cheap screw plug and the blame cannot be laid to the floor or wall receptacle any more than to a socket on the bracket or ceiling fixture.—F. F. H., Milwaukee, Wis.

No. 478.—Lamp Bank for Testing.—In several repair shops I recently noticed use of a lamp bank arrangement with 0-300 ammeters for testing armatures for "opens," "shorts," etc. I would like to get through the queries column a wiring diagram for such a lamp bank arrangement that is not too complicated to make in the shop. I have tried several schemes without good results.—J. D., Detroit, Mich.

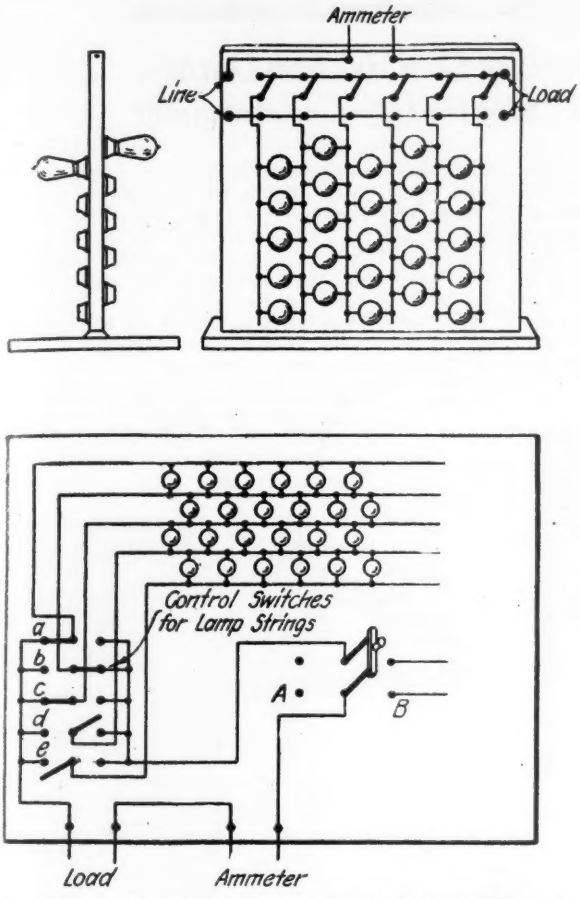
Answer A.—The lamp bank is the most practical form of rheostat available. Lamps are available almost everywhere, hence a lamp bank can be built anywhere, and broken resistors or lamps renewed easily and cheaply.

Lamp banks may be divided into two classes, namely, those of the stationary and those of the portable type. The only difference is in the wiring and the mounting of the lamps. Both types of lamp bank are useful around workshops, car barns and similar places. The portable type of lamp bank should be as light as possible and compact so as to permit of being easily carried.

The accompanying upper diagram shows a form of portable lamp bank quite extensively employed for test purposes where the lamp bank does not ordinarily require to be moved away from the shop. Where long distances have to be travelled it is well to build a box, using the two largest inner surfaces for the mounting for the lamps and two of the smaller sides hinged

together and clamped when closed. In this way a lamp bank may be easily carried around without danger of breaking the lamps.

In the lamp bank shown, wood about 1½ ins. thick should be used, being light and yet sufficiently thick for ruggedness and strength. Such a lamp bank will measure about 3 ft. high, 2½ ft. long and 1 ft. wide. The wood used should be dry and painted with varnish. The lamp sockets should be located sufficiently far apart to permit inserting 100-watt lamps. This means a horizontal distance of about 3 ins. The wire used should be covered with asbestos or may be enameled. The control switches at the top of the rheostat should be for 220-volt service and rated at 15 amperes. The terminals should have ample cross section, as should also the wire, because good voltage regulation is often important and lamps constitute a constant resistance, once up to temperature. Carbon lamps should preferably be used, as they are rugged. Old lamps can often be used as the resistors.



No. 478.—Two Designs for Lamp Banks, One Portable and the Other Stationary.

A lamp bank as described may be made single, that is, may have lamp sockets installed on one side only, in which case no legs or foundation is required. Having lamp sockets on both sides doubles the capacity of the rheostat for absorbing energy. A single lamp bank about the size given above will contain about 30 lamps, the double lamp bank about 60 lamps, representing an energy absorbing capacity of 3 and 6 kw., respectively, at 110 volts.

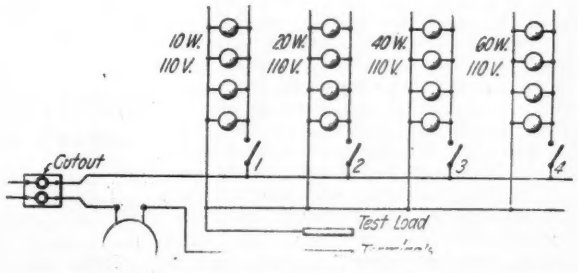
It may be pointed out that the control switches should be closed alternately up and down for 110-volt supply, and every other switch up and down, respectively for 220-volt supply. With the arrangement of switches shown great flexibility of current variation can be obtained. Even greater flexibility is obtainable by cutting in or out individual lamps in any set of string, as required. In this way almost any variation within the two extremes can be obtained, not only by cutting out individual lamps, but by using lamps of different wattage as well.

A stationary lamp bank or rheostat may be built up of old switchboard panels, based upon the same principle as the portable lamp bank. The second sketch shows the elementary wiring diagram. The special features to note in this diagram are that terminals are provided for inserting an ammeter and also for measuring the voltage drop across the load other than the lamps. In this way voltage drop, current and energy can be measured, as well as power-factor on alternating-current supply.

Another feature to note is the double-throw main knife switch. One side may be for 220-volt supply, the other for 110 volts, or when the switch is thrown to, say, *A* direct current may be tapped, when thrown to *B* alternating-current supply is furnished. This offers a very flexible arrangement and is obtained cheaply.

Instruments may be installed permanently, if desired, but the terminals provided in the sketch enable portable instruments to be inserted in circuit only while required. It may be found convenient to employ different wattages for the various strings of lamps, for example 100-watt lamps for some strings, 60-watt lamps for others and 25-watt lamps in others. By changing lamps and similar manipulation, practically any current can be secured. The total energy consumption of such a lamp bank depends upon the size and number of lamps used.—B. W. S., Cicero, Ill.

Answer B.—Herewith is a sketch of a small lamp bank resistance for testing motors, repair parts and small electrical appliances. Single-pole knife switches 1, 2, 3, etc., are used to control the lamp circuits, which may contain different sizes of lamps such as those indicated. The branch circuits in this case should be No. 12 wire; the mains and testing line should be No. 10 because they carry the entire current. The test terminals should be provided with small handles for convenience, also with thumb clamps to make quick connections. Knob or cleat wiring suffices in practically all cases. For heavier work a larger number of lamp circuits may be needed or larger lamps used; in this case also a larger ammeter than 0-50 must also be provided.—F. F. H., Milwaukee, Wis.



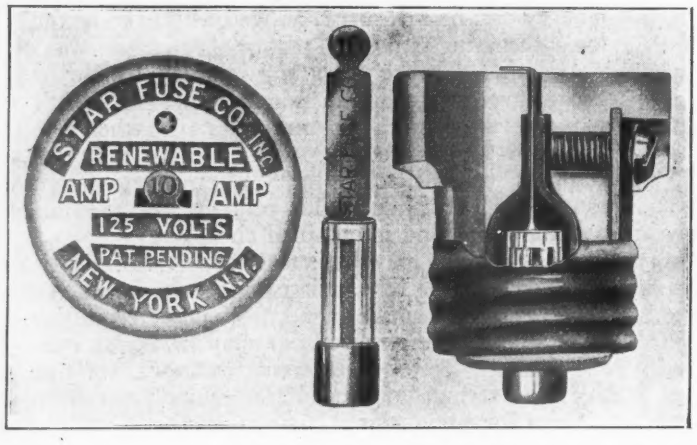
No. 478.—Another Design for a Simple Lamp Bank.

New Appliances

Renewable Plug Fuse—Farm Service Combination Outfit—Novel Fixture—Safety Thermal Cutout—Dry-Cell Ammeter

Star Renewable One-Piece Fuse Plug.

The Star Fuse Co., Inc., 290 Church street, New York City, is putting on the market a renewable one-piece fuse plug that requires only a half a turn of the screw driver to remove a blown fuse.



Partial Section and View of Star Renewable One-Piece Fuse Plug.

The construction of it is such that one end of the inner cartridge enters the fuse through the bottom, and is clamped between two flat pieces of brass at the top of the plug by the means of a screw. The other end terminates in a brass cap, which makes contact similar to the non-renewable type. A piece of glass tubing protects the delicate part of the fuse from kinking or bending so that it can be handled without injury.

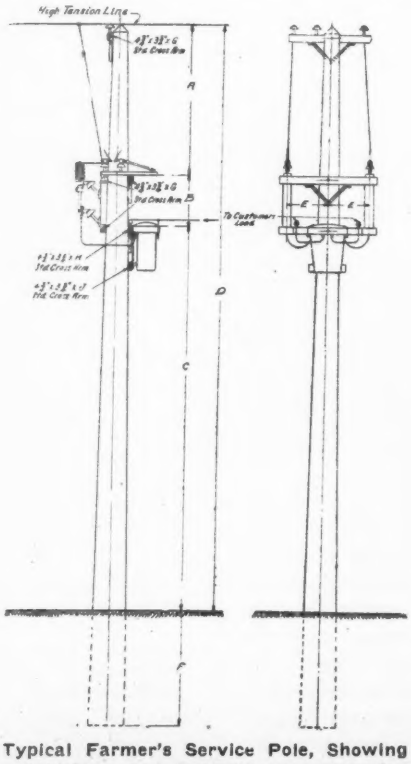
The fuse element also projects slightly outside of the plug and on this projection the ampere rating is stamped. There are claimed for this renewable plug fuse the following advantages: There is nothing to take apart in order to renew the plug fuse. The plug fuse can be renewed in seven seconds. The projection of the fusible element outside of the plug not only shows the size fuse inside, but also offers a means for the testing of the plug without removing same from the cutout. All the melted material of the blown fuse is kept in the glass tube and the inside of the plug is constantly kept clean. The most important feature is the fact that the renewable element sells for one-quarter of the present cost of a nonrenewable plug fuse.

Farmer Line Switching and Protective Combination.

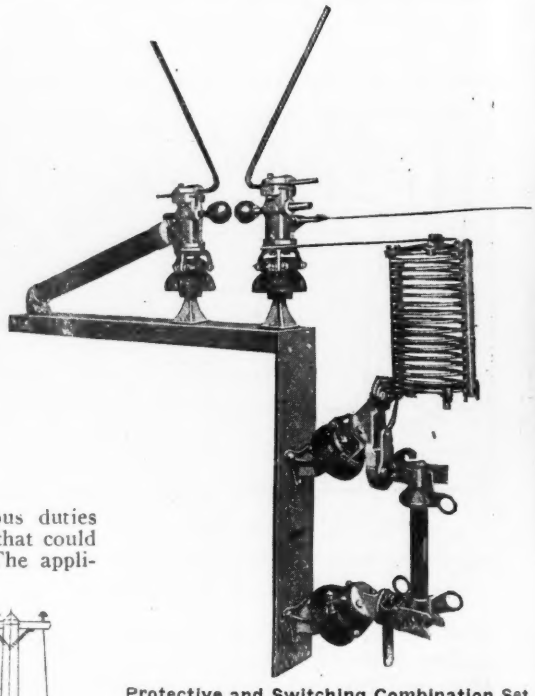
The rapid extension of electric transmission lines into rural districts has given farmers and other inhabitants of these communities the opportunity to make use of this wonderful agent of nature. They can enjoy its many benefits which heretofore have been available only to dwellers in urban districts.

Individually, the farmer is probably a larger consumer of power than many other trades or professions. Agricultural activities will no doubt be carried out upon a more extensive scale in the future than they have been in the past. There are many arduous duties to be performed on the farm that could be done by electric power. The application of electricity to these tasks will be a saving to the farmer and enable him to be a bigger and better producer.

Farmers throughout the country are finding that the highest tension lines of the central-station companies are being extended to their front doors. It is only necessary to connect up, install their secondary systems and enjoy the benefits of electricity. The central-station company in turn finds a new and profitable field for the consumption of power.



Typical Farmer's Service Pole, Showing Switching and Protective Combination and Stepdown Transformer.



Protective and Switching Combination Set for Farmer's Service from High-Tension Lines.

The substation which serves the farmer must of necessity be simple, compact and foolproof. For this purpose a special switching and protective combination set has been designed by the Electrical Engineers Equipment Co., Chicago, primarily for use with farmers' lines. It consists of a sphere-gap lightning arrester of the permanent resistance type, a choke coil and fused disconnect.

The accompanying sketch shows how this equipment can be mounted on one pole and tapped to a through running line. The wiring is exceedingly simple. A complete choke coil is supplied, not merely a few turns. The fused disconnect is of the expulsion type. It can be opened by an ordinary switchhook. The fuse tube can be lifted from its mountings, taken down and refilled quickly and economically. The lightning arrester is so located as to give

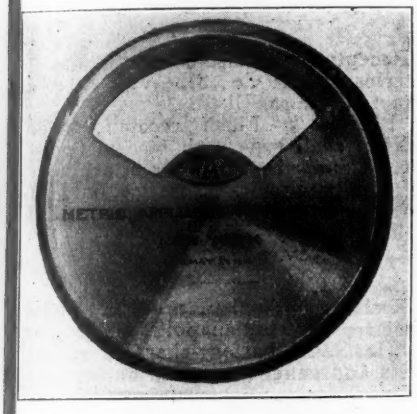
any high-voltage surge a direct path to ground.

This equipment is built for all standard voltages up to and including 22,000 volts. The last mentioned voltage is as high as it is usually practical to tap to a farmer's station. While stations of this type are most usually built for single-phase service, they are also obtainable for three-phase service.

The standard equipment includes a single or three-phase outfit, as the case may be, a treated wood switchhook for operating the fused disconnect, and six extra fuse links of proper capacity. All corrosive parts of this equipment are hot-dipped galvanized; bolts, nuts and pins are sherardized.

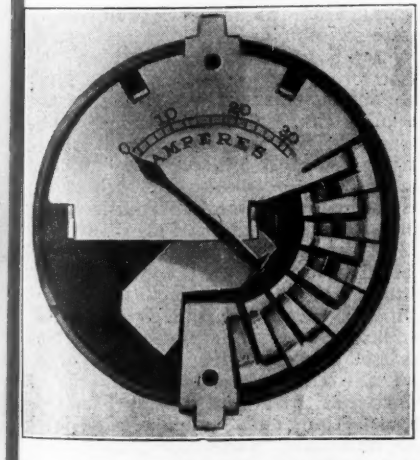
Pocket Ammeter for Testing Dry Cells.

A unique type of pocket ammeter is being placed on the market by Metric Appliance Corp., 299 Broadway, New York City. This meter is designed pri-



View of Case for New Pocket-Size Ammeter.

marily for testing dry cells and affords the only means of indicating the condition of the cell. It is constructed so that contact may be made directly with the battery without the use of a wire



Ammeter Body After Case Is Removed.

lead, but a terminal is provided so that a lead can be used, if so desired.

A dry cell may be tested by placing the metal insertions on the back of the ammeter against the terminals of the cell. Each small division on the dial represents 2 amperes. A dry cell of commercial size, when new, registers approximately 28 amperes.

A one-piece aluminum punching serves for the coil or solenoid, for the terminals, the dial plates, the mounting for the armature and the supports for the glass. The whole is placed in a rubber composition case, thus comprising an ammeter of very simple design and construction. This unique construction eliminates soldering and screw connections common in other meters, thus making a very durable, dependable and accurate instrument. The meter is sealed so that it cannot be opened or tampered with, and should give long and satisfactory service.

The stamped coil or solenoid is the feature of this invention and may be made adaptable to other electrical devices, such as relays, circuit-breakers, indicating instruments, transformers or other appliances that require the use of a solenoid and armature.

Safety Cutout to Prevent Overheating of Electrical Heating Devices.

There is a recognized fire hazard from the overheating of electrical devices, such as pressing irons, when the operating current is left on indefinitely. An ordinary circuit fuse which melts only in the case of current overload fails to prevent such overheating due to the normal current.

A device has been invented by Wilhelm Gattiker and Wilhelm Baumann, Nordstrasse 273, Zurich, Switzerland, which consists of a fuse that melts when the device reaches an unsafe temperature. It consists of a wire or strip of a metal alloy similar to fuse metal which is included in the electrical circuit and which is designed to melt as soon as an unsafe temperature is reached, thus opening the circuit and cutting off the supply of energy.

The cutout is constructed in different forms, according to the devices with which it is to be used. It may form a part of the device itself; it may form a connection between the device and the leading-in wires, or it may be connected in the lead wires themselves. The cutout may be placed on any convenient part of the heating device, as for example, a plug in the wall of the device.

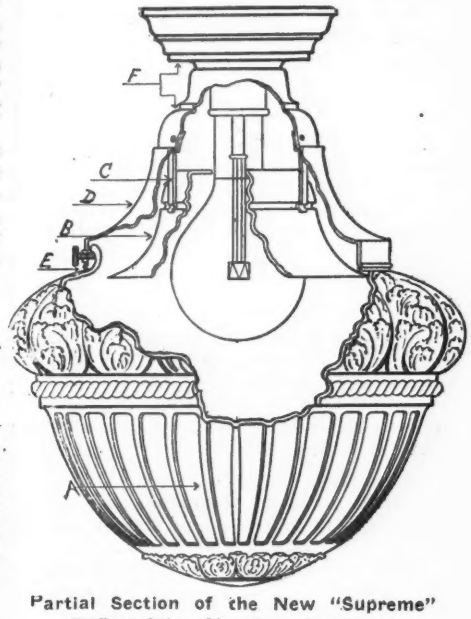
The inventors of the device are anxious to make arrangements with American manufacturers for its use in this country.

Many Features Embodied in New Model of Reflectolyte Fixture.

A new lighting unit, known as the "Supreme Reflectolyte," and manufactured by the Reflectolyte Co., St. Louis, Mo., to embody certain advanced ideas of beauty and design, has just made its appearance on the market.

It is developed along artistic, scientific and mechanical lines, and utilizes and effectively controls the rays emitted by the light source, converting them into a flood of soft, cheerful light of a color and quality suitable for general indoor lighting. The new unit comes in several artistic designs and sizes and is suitable for public or office buildings where efficient lighting is desired.

It is apparent, from the sectional drawing herewith, that the new Reflectolyte has a number of new features, including the translucent blown glass urn *A*, of beautiful outline and surface ornamentation in classic and Gothic periods; the bell-shaped metal holder or body *D*, which supports the urn and completes its



Partial Section of the New "Supreme" Reflectolyte, Showing Construction Features.

graceful outline; the concealed steel reflector *B*, with its white porcelain-enameled reflecting surface fused on at the temperature of melting glass, and which utilizes the horizontal and upwardly inclined rays, redirecting them outwardly and downwardly; the spring fingers *C* which support the porcelain-enameled reflector in a fixed position with relation to the lamp filament and the bowl, and which permit instant removal and replacement.

A very interesting feature is its system of ventilation. The cool air entering at junction *E* of the urn and the metal holder, rises between the body *D* and the nonreflecting surface of the reflector *B* and passes out at *F*. Thus, it will be seen that any dust or dirt entering the unit will not be deposited either on the inner surface of the urn, on the reflecting surface of the reflector, or on the lamp itself. At the same time ample ventilation is provided.

Another interesting feature is the position of the filament of the lamp, which is not in the center of the urn, as is usually the case, but is positioned high up on a horizontal plane with the lower edge of the reflector and the upper portion of the urn. This unusual arrangement accounts for what is claimed to be its superior efficiency, wide distribution, perfect diffusion and the beautiful appearance of the urn when lighted.

The light source is entirely inclosed and thus insects, dust and dirt are satisfactorily excluded and cannot become appreciable factors in dimming the light or in detracting from the general beauty of the unit itself, which is so often the case.

Lately Approved Appliances

The electrical fittings listed and described in this department have been approved by the Underwriters' Laboratories, Incorporated, after examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

Attachment Plug, Fuseless.—Hemco Electric Manufacturing Co., 246 Third avenue, New York, N. Y.
"Tu-Piece." Separable attachment plug having composition base and cap. 660 watts, 250 volts.
Listed Oct. 2, 1919.

Cartridge Fuses, Renewable.—Economy Fuse & Manufacturing Co., 328 West Kinzie street, Chicago.
"Economy" cartridge inclosed fuses. 0-600 amperes, 250 volts; 0-600 amperes, 600 volts.
Listed Dec. 1, 1919.

Cartridge Fuses, Renewable.—Chicago Fuse Manufacturing Co., 1014 West Congress street, Chicago.
"Union" cartridge inclosed fuses. 0-600 amperes, 250 volts.
Listed Dec. 1, 1919.

Cartridge Fuses, Renewable.—Federal Electric Co., Lake and Desplaines streets, Chicago.
"National" cartridge inclosed fuses. 0-400 amperes, 250 volts; 0-100 amperes, 600 volts.
Listed Dec. 1, 1919.

Cartridge Fuses, Renewable—Multiple Electric Products Co., Inc., 61 Broadway, New York, N. Y.
Fuses of cartridge form having four elements, any one of which may be connected in circuit by twisting ferrule, or blade. Four-In-One "Atlas." 0-200 amperes, 250 volts; 0-30 amperes, 600 volts.
Listed Dec. 1, 1919.

Cartridge Fuses, Renewable.—Trico Fuse Manufacturing Co., Milwaukee, Wis.
"Trico" cartridge inclosed fuses. 0-600 amperes, 250 volts; 0-600 amperes, 600 volts.
Listed Dec. 1, 1919.

Cutout Bases, Plug-Fuse.—Kirkman Engineering Corp., 237 Lafayette street, New York, N. Y.
Catalog Nos. 1935, 2135, 2165, 2199, 2569, 2587, 2965, 8042.
Listed Sept. 23, 1919.

Cutout Bases, Plug-Fuse.—Majestic Electric Manufacturing Co., 806 North 12th street, St. Louis, Mo.
"Majestic," 0-30 amperes, 125 volts. Catalog Nos. 1935, 2965.
Listed Sept. 16, 1919.

Heating Appliances, Cooking and Liquid.—Manning, Bowman & Co., Meriden, Conn.
Grill, 550 watts, 110 volts. Catalog No. 1400.
Listed Sept. 19, 1919.

Heating Appliances — Flatirons.—Landers, Frary & Clark, New Britain, Conn.
"Universal." 106-114 volt, 5.3 amperes. Catalog Nos. 901, E902, 905. 6 lb. 106-114 volt, 3.2 amperes. Catalog No. 9021. 3 lb.
Listed Oct. 24, 1919.

Insulating Materials.—Campbell Fibre Co., Stanton, Del.
"Abaroid." Fiber sheets having following properties: Absorptive to about same extent as ordinary fiber; readily combustible; moderate dielectric strength; not noticeably affected by temperature of 125° C.; moderate mechanical strength and readily worked with tools.
While insulating material of this general type is not classed as either nonabsorptive or noncombustible and should, therefore, not in general be used as substitute for materials so classed, this fiber is judged to be suitable for crossbars, washers, bushings and other small parts of electrical fittings where use of fiber has been recognized.
Manufacturers desiring to use this material should submit samples in commercial form for examination and test by Underwriters' Laboratories.
Listed Oct. 29, 1919.

Insulating Materials.—Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.
Molded insulating, noncombustible compound of moderate dielectric and mechanical strength, somewhat brittle, unaffected by oils and very slightly absorptive of moisture. No. 120.
Is suitable for use in electrical fittings requiring material possessing above characteristics. Manufacturers of such devices desiring to use this material should submit samples in commercial form for examination and test by Underwriters' Laboratories.
Listed Oct. 6, 1919.

Insulating Supports.—B. & K. Manufacturing Co., New Britain, Conn.
"B. & K." Stamped steel bases, galvanized, to which porcelain insulators are bolted. For use with wire No. 4 B. & S. gage or smaller. Catalog Nos. 1200-03.
Listed Sept. 19, 1919.

Lamp Shades.—J. A. Whaley & Co., 118-120 Fifth avenue at 17th street, New York City.
"Kno-Glair." Pleated linen lamp shades. Catalog Nos. 918-21.
Listed Oct. 31, 1919.

Outlet Plate.—George Buckels, 7717 Fielding avenue, Chicago, Ill.
"Buckels." Steel outlet plate with means for bonding to gas pipe.
Listed Nov. 11, 1919.

Outlet Plates.—Sterling Manufacturing Co., Erie, Pa.
"Ideal" steel outlet plate with combination hickey and crowfoot attached for use with knob and tube work.
Listed Oct. 9, 1919.

Raceway Fittings, Metal. — The American Conduit Manufacturing Co., New Kensington, Pa.
Fittings for use with "Wiremold" metal raceway. Receptacle base. Catalog No. 525.
Listed Sept. 26, 1919.

Receptacle for Attachment Plugs.—Peerless Light Co., 813 West Adams street, Chicago, Ill.
"Peerless." Flush receptacles of Edison shell type with face plate attached and wire leads for attachment to supply circuit. For use only in standard outlet boxes. 660 watts, 250 volts. Catalog No. 111.
Listed Nov. 3, 1919.

Resistance Appliances.—Hatfield Electric Co., Indianapolis, Ind.
"Hatfield" battery-charging rheostats and panel for use in automobile service stations, when mounted in accordance with National Electrical Code requirements for rheostats and 4 ft. above floor, or located in room or inclosure provided for this purpose. 10 amperes, 110-220 volts.
Listed Nov. 3, 1919.

Rosettes, Fuseless.—Majestic Electric Manufacturing Co., 806 North 12th street, St. Louis, Mo.
"Majestic." 3 amperes, 250 volts. Catalog No. 2696-B.
Listed Sept. 16, 1919.

Switches, Fixture.—McGill Manufacturing Co., Valparaiso, Ind. "Brascolite No. 78." (4793M.)
Listed Oct. 2, 1919.

Switches, Oil-Break.—Textile Machine Works, Reading, Pa.
Non-automatic, oil-immersed, drum contact switch designed for control of motors driving knitting machines. 2 hp., 550 volts, 2 and 3 phase, 60 cycles.
Listed Oct. 17, 1919.

Switches, Push and Rotary Flush.—Crouse-Hinds Co., Syracuse, N. Y.
Double-pole, panelboard switches. Catalog Nos. B-52964-66.
Listed Nov. 6, 1919.

Switches, Surface. — Crouse - Hinds Co., Syracuse, N. Y.
Double-pole, panelboard switch for mounting directly on busbars. Catalog No. B-52963.
Listed Nov. 6, 1919.

Trade Activities

American Steam Conveyor Appoints St. Louis Agent—New Members Stone & Webster Partnership—Trade Literature

National X-Ray Reflector Co., 235 West Jackson boulevard, Chicago, is sending out an attractive wall calendar for 1920, on each page of which is shown a different type of its reflectors and projectors for factory lighting, flood lighting, show-window lighting, indirect lighting, wall-case lighting, etc.

Spero Electric Co., Cleveland, Ohio, formerly of 5122 Portland avenue, recently acquired a building at East 33rd street and Woodland avenue, which it has remodeled for the manufacture of its products, comprising a complete line of switchboards, tablet boards, fuse boards and cabinets. The personnel of the company consists of B. E. Spero, Leon Spero, S. W. Spero and A. F. Cibs.

Kaestner & Hecht Co., Chicago, builder of electric elevators, has received an order for 14 K. & H. electric elevators to be installed in the Drake Hotel. This important project is now under construction and when completed will represent one of the most modern and exclusive hotels in Chicago. The K. & H. elevators embody engineering standards that have been productive of results unsurpassed by many in the industry. They are characterized by their smoothness of operation, ease of riding, economy and efficiency, and it is these features that have prompted their selection for this as well as many other installations.

Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has just issued a new 36-page booklet, with an attractive 3-color cover, which has for its title the "Westinghouse Underfeed Stoker." Under the head of "Details of Construction," it gives a comprehensive description of the leading features of design contributing to the efficiency and reliability of operation. The interconnection of grates and tuyeres and the arrangement of brackets, gears and fuel deflecting plates, are clearly described. Taking up the principles of operation, the circular explains, by use of sectional cuts and charts, the distinctive features of the Westinghouse zone system of air distribution. The subjects of "Efficiency" and "Capacity" are taken up together with "Flexibility." Curves setting forth extensive performance data relative to these subjects and others are used to amplify the text. Under the subjects of "The 'Coal-Saving' Problem" and "Fuel Burning Equipment of Modern Power Stations," an interesting and instructive array of information is given for the benefit of those who have the operation of stokers in charge. A large list of representative installations making use of these stokers is another prominent feature. The printed matter is profusely illustrated.

Apex Appliance Co., 3223 West 30th street, Chicago, sustained a loss estimated at $200,000 when, on Dec. 29, fire visited its plant and destroyed several hundred washing machines. The loss is partly covered by insurance.

Delta-Star Electric Co., Chicago, has issued bulletin No. 35 detailing plans for serving farmers from high-tension lines. It contains considerable data on various forms of contracts for taking on this service at a profit to central stations.

Western Electric Co., 195 Broadway, New York, announces the following assignments of men to handle its steamship and steam railroad business: E. R. Morgan at the Boston house to handle the New England territory; William Lancaster at the Richmond house to handle the territory which includes Virginia and North Carolina, and R. D. Eves at Cincinnati to handle the territory embracing Kentucky, Tennessee, southern Indiana, southern Ohio and the western part of West Virginia.

Trumbull Electric Manufacturing Co., Plainville, Conn., has now ready for distribution bulletin No. 3, 3½x6 ins., on "Safety" switches, externally operated, and includes all the latest listings of the "Circle T" lines covering many additions to such lists as appeared in bulletin No. 2. Among the important additions to the company's line of safety switches shown in the new catalog and bulletin No. 3 are: 800-1200-ampere switches, no fuse and fusible single throw; quick-make and quick-break switches, no fuse, 250 volts (30-600 amperes); fusible switches and motor-starting switches equipped with 100% safety shield; wiring data for motors with list of safety switches to be used with each type of motor, and a full set of box and drilling dimensions of all safety switches listed. The Trumbull company has also issued a new catalog, designated as No. 12, which includes a complete line of knife switches, safety switches, and other wiring devices, and is so bound that by removing the fastening clips, additional pages may be inserted. It is 8x10½ ins. in size, printed in 3 colors and comprises 164 pages. The company expects shortly to publish a catalog covering its panelboard switches, which will include 3 bulletins bound together under one cover. These are as follows: Bulletin No. 1, covering dead front panels with push switches and branches for light duty; bulletin No. 2, covering dead front panels with tumbler switches and branches for heavy duty, and bulletin No. 3 covering live front panelboard cabinets, panel circuits, and a variety of switchboard accessories.

American Steam Conveyor Corp., Chicago, announces that the Atlas Machinery & Supply Co. is now handling the sale of the American steam ash conveyor in the St. Louis territory. This company has offices at 1416 Syndicate Trust building, St. Louis, Mo., and is a new sales organization in that vicinity. It is headed by William H. Patton, who recently returned to the United States after 2 years' service in the army, during which time he was in 9 branches of the service, gaining experience of great practical value. Associated with Mr. Patton is his brother, W. R. Patton, who for the past 20 years has traveled the Central West, engaged in the sale of power plant equipment. During the past 4 years he has represented several of the large manufacturers as district manager. N. B. Stewart, who has been identified with the power plant machinery business at St. Louis for 25 years, has also associated himself with this company. His acquaintance and experience will assist the organization to give real service to the trade. The experience behind this new agency is such that it should soon make a name for itself, as being among the active of American Steam company representatives.

Stone & Webster, Boston, industrial engineers, have admitted six new partners into the organization, all of whom have long been leading members of the firm and have played prominent parts in its wide activities. The new partners are Frederick P. Royce, George O. Muhlfeld, Henry B. Sawyer, Frederick S. Pratt, Harry H. Hunt and Howard L. Rogers.

Mr. Royce is an able expert in public utility matters and has directed the investigation Stone & Webster made into the affairs of the Interborough and Brooklyn Rapid Transit companies. Mr. Muhlfeld is general director of the division of engineering and construction with headquarters in New York. For years Mr. Sawyer has been treasurer of the companies managed by Stone & Webster. He recently left for Japan as head of a party of investigators and engineers. Mr. Pratt has had charge of a group of the firm's properties, including the hydroelectric, lighting and railway system of the Puget Sound Traction, Light & Power Co. Mr. Hunt has devoted himself to the management of various public utilities and Mr. Rogers has had continuous experience in the division of engineering and construction, and is in charge of the main office in Boston. The other members of the firm are Charles A. Stone, Edwin S. Webster, Russell Robb and Henry G. Bradlee.

Current News

News of Construction Activities and Business Opportunities

EASTERN STATES.

Castleton, Vt.—Castleton Works of the Stasco Milling Co. has arranged for increased power service at its plant to the amount of about 1500 hp. Electric energy is furnished by the Rutland Railway, Light & Power Co.

Rutland, Vt.—Vermont Hydro-Electric Corp. has awarded a contract to the National Engineering Co., Boston, Mass., for the construction of the new dam in connection with the Glenn development, near Rutland. The company is making rapid progress on the construction of the power plant at the site, and the company has signed contracts for considerable quantities of electric power for the operation of various local plants, including the works of the Fellows Gear Shaper Co., Sullivan Machine Co., New York Consolidated Slate Co., Mahar Brothers Slate Co., and others.

Fall River, Mass.—In connection with the proposed expansion plans of the American Thread Co., plans have been arranged for the erection of a large boiler plant, as well as the reconstruction of the power facilities of the works during the winter to be followed with general expansion work in the manufacturing end of the business during the spring and summer.

Gloucester, Mass.—General Electric Co. is having plans prepared for the establishment of a new local plant. The company has acquired several buildings, which will be equipped as an armature-winding works. The company is also planning for the construction of a large new drop forge works on property comprising about 7 acres recently acquired on the Annisquam river, Boston.

Medford, Mass.—Contract has been awarded by the Warner & Childs Co., 15 Winchester street, for the erection of a new boiler plant in connection with the erection of a new 4-story factory, about 100x225 ft.

Hartford, Conn.—Frasse Steel Co. has completed plans for the erection of additions to its plant. These will involve an expenditure of $100,000 and will nearly double the present capacity of the plant.

Newport, R. I.—Considerable electrical and mechanical equipment will be required in connection with the construction of the proposed laundry building by the Bureau of Yards and Docks, Navy Department (Specification 4081), at the local government station. The proposed structure is estimated to cost $60,000.

Binghamton, N. Y.—Endicott-Johnson Corp., Endicott, has arranged with the Binghamton Light, Heat & Power Co. for the furnishing of electric energy in connection with the proposed housing development of the company for its employes' service.

Brooklyn, N. Y.—Stagg Laundry, Inc., 150 North 5th street, has had plans prepared for the erection of a new 2-story extension to its plant, for increased operations. New electrical and mechanical equipment will be required.

Buffalo, N. Y.—Bureau of Yards and Docks, Navy Department, has had plans prepared for the construction of a new radio building (Specification 4108) at the local government station. C. W. Parks is chief engineer.

Buffalo, N. Y.—Arrangements are being made for the complete electrification of all railroad terminals in Canada within the near future, according to reports of D. B. Hanna, general manager of the Canadian government railways.

New York, N. Y.—New York Lighting Fixture Manufacturing Co., 67 Spring street, has filed notice with the secretary of state of an increase in its capital from $10,000 to $25,000, to provide for general business expansion.

New York, N. Y.—Hemco Electric Co., 246 3rd avenue, has had plans prepared for alterations and improvements in its plant at First avenue and 40th street. The work is estimated to cost $12,000. Ferdinand Savignano, 6005 14th avenue, Brooklyn, is architect.

Niagara Falls, N. Y.—It is said that negotiations are pending between the United States and Canada relative to Niagara Falls hydroelectric power which are expected to result in the extension of power projects on the American side, as well as new developments.

Syracuse, N. Y.—Syracuse Washing Machine Corp., manufacturer of electrically operated washing machines, etc., a Delaware incorporation, has filed notice of authorization to operate in New York. J. N. Derschaug, Syracuse, has been appointed to act as corporate representative of the company.

Wayland, N. Y.—Wayland Light & Power Co. will build an addition to its plant and also construct and operate a new plant at Conesus for local service.

Jersey City, N. J.—Consolidated Oil Well Drilling Co., 18 Journal square, will install 100-kv-a. transformers, 2300 volts primary and 220 secondary a. c.

Jersey City, N. J.—Public Service Corp. has submitted a bid to the city commission for the furnishing of electric service for the operation of the street-lighting system for a period of 5 years. The bid calls for the furnishing of service for lights at rates ranging from $60 to $80 per light per year, with special "white way" type lamps at $110 per year.

Keyport, N. J.—Plans are being arranged for the immediate construction of the proposed pumping plant at the municipal water works station.

Newark, N. J.—Considerable new electrical and mechanical equipment will be required in connection with the construction of the proposed laundry building of the New York Linen Supply & Laundry Co., 232 East 32nd street, New York, to be located on High street, extending to Summer avenue. The company has broken ground for the erection of this plant, which is estimated to cost $72,000.

Newark, N. J.—In connection with the construction of the proposed silk mill of Arthur Emmerich on property recently acquired on Norfolk street, plans are being prepared for the erection of a 3-story electric power plant for general factory service. Considerable electrical and mechanical equipment will also be required for the works proper.

Newark, N. J.—Announcement has been made by the New York Telephone Co. that the expansion program of the company for the northern New Jersey district, calls for an expenditure of about $7,740,000 for telephone plant and property. Included in the proposed work will be over 30,000 new telephone lines and approximately 200 new switchboard positions; the installation of new cable, construction of pole lines, installation of new trunking facilities between central offices as well as other work.

Rutherford, N. J.—Braedner Tire Co., 32 Broadway, New York, is understood to be having plans prepared for the construction of a new power plant at its local works, for general factory operation. Andrew Kidd, Jr., 95 Liberty street, New York, is engineer for the company.

Trenton, N. J.—Original Trenton Cracker Co., 17 South Stockton street, is arranging for increased power facilities at its plant to augment the present output of the company's products. Service is furnished by the Public Service Corp.

Trenton, N. J.—Announcement has been made by the Trenton & Mercer County Traction Corp. that plans are being perfected for the purchase of considerable new rolling stock, to involve an expenditure of about $250,000. Rankin Johnson is president.

Trenton, N. J.—Crescent Insulated

Wire & Cable Co., Taylor street and Olden avenue, has had plans prepared by J. Osborne Hunt, 114 North Montgomery street, for the construction of a large new addition to its plant on property recently acquired at Taylor street and Ginder alley. The proposed structure will be of steel and concrete, 1 story, about 50x125 ft., and will be used to provide for increased capacity. The new addition is estimated to cost $40,000. It is proposed to inaugurate construction at once to allow for operation at the earliest possible date.

Wharton, N. J.—Fire recently destroyed the entire pyrometer house at the plant of the Replogle Steel Co., formerly known as the Wharton Steel Co. The boiler plant at the works was also damaged by the fire. It is understood that the company is arranging plans for the immediate rebuilding and repair of the destroyed structures.

Allentown, Pa.—Lehigh Coal & Navigation Co. is perfecting arrangements in connection with the proposed extensions in its plants and system, estimated to cost $3,000,000. It is understood that a large portion of this sum will be used to provide for the construction of new transmission lines to increase largely the present power capacity.

Ringtown, Pa.—Ringtown Electric Light, Heat & Power Co. contemplates the purchase of additional equipment, including a switchboard, 10 transformers, meters and overhead-line material. J. A. Yost is manager of the company.

New Castle, Del.—Wilmington & Philadelphia Traction Co. has perfected plans for the installation of new electrical machinery at its New Castle terminus to improve the electric service for the operation of the New Castle and Delaware City electric cars.

Wilmington, Del.—Sun Co. has awarded a contract for the construction of a new 1-story brick pump house addition at its property on Russell street.

Baltimore, Md.—Steinmetz Electric Motor Car Co., recently organized with a capital of $2,000,000, will build an assembling plant for electric trucks and light motor cars, and will manufacture parts in other cities. The cars are under patents of Dr. Charles P. Steinmetz, consulting engineer of the General Electric Co.

Oxford, Md.—Bonds in the amount of $18,000 have been voted for the erection of an electric light plant. Address mayor.

Hendersonville, Va.—Home Electric Co. will begin improvements costing several thousand dollars in enlarging its plant.

Norfolk, Va.—Virginia Railway & Power Co., T. S. Wheelwright, president, Richmond, Va., is planning $1,300,000 investment for equipment and plant improvements.

Raven, Va.—Sam L. Matz Coal Corp. will install an electric plant in connection with its mining operations. The company is in need of mining equipment, including cutting machines, hauling motors, pumps, locomotives, etc.

Charleston, W. Va.—McQuaide Storage Battery Co., 906 Virginia street, recently organized with a capital of $10,000, has acquired a local building under lease, and is planning for the installation of machinery and equipment for the manufacture of storage batteries. D. A. McQuaide is president and manager.

Buckner, N. C.—Green Light & Power Co., Pleasant Hill, N. C., will furnish light and power to homes and business houses and will install 24 street lamps.

Greensboro, Ga.—About $10,000 will be expended for improving electric light plant. Address mayor.

Smithville, Ga.—The city is planning to construct electric light, water and power systems. Bonds will be voted. Address J. H. Randall, Jr., mayor.

Moore Haven, Fla.—The city will extend and improve its lighting system and extend its waterworks and street paving, for which purpose $69,000 bonds have been voted.

Palm Beach, Fla.—The city will improve and extend its electric lighting system and contemplates voting on $10,000 bonds. Address the mayor.

West Palm Beach, Fla.—Bonds to the amount of $10,000 will be voted to improve and extend the electric lighting system. Address Harry Fugats, engineer.

NORTH CENTRAL STATES.

Ashtabula, O.—The city council has passed an ordinance for the purchase by the city of the Ashtabula Rapid Transit line at a consideration of $96,000. Address city engineer.

Dover, O.—At a special election Dover voted a bond issue of $100,000 to enlarge its municipal electric plant and to replace natural gas engines with steam engines.

Mansfield, O.—The old power station of the Richland Public Service Co. was destroyed by fire recently, entailing a loss of about $100,000. Eight automobiles, line equipment and hardware, transformers and gas and electric appliances were stored in the building.

Youngstown, O.—Electric Alloy Steel Co., incorporated with a capital of $1,500,000, will erect a plant for the manufacture of high-speed electric alloy steel. The plant will cost approximately $1,000,000. Two electric furnaces of large capacity will be erected, and a 10-in. and a 16-in. and a 500-ton hammer will be installed. Initial products will be vanadium, chrome and nickel steel.

Bedford, Ind.—Rider Canning Co. will erect a canning factory at Heltonville, Ind., 10 miles from this city.

Decatur, Ind.—The council has been granted authority to issue $75,000 power plant bonds. Address W. A. Lowes.

East Chicago, Ind.—The machine shop and office of the George B. Limbert Co. has been destroyed by fire with loss of $150,000.

Huntington, Ind.—Caswell-Runyan Co. will erect a large addition to its plant.

Lafayette, Ind.—Monon Railroad Co. will erect a new office building, brick, 2 stories high, to cost $40,000.

Lebanon, Ind.—Interstate Public Service Co. has been authorized to issue $490,000 refunding and extension bonds. Address D. J. Oglesby, agent.

Portland, Ind.—Bonds in the amount of $120,000 have been voted for a municipal power plant. Address city clerk.

Champaign, Ill.—H. P. Kruse has been awarded the contract for erection of a high-tension line from Champaign to Mahomet, Ill., the contract price being $22,000. The village of Mahomet will be equipped with a distribution system, the current to be supplied by the Urbana and Champaign Railway, Gas & Electric Co.

Chicago.—Illinois Glass Co. plans for itself and subsidiary corporations improvements which will involve an expenditure of $500,000. The 157,462 sq. ft. at the northwest corner of Crawford and Wrightwood avenues will be the site for 1 and 2-story buildings with a total floor area of 161,000 sq. ft. New factory buildings for its subsidiaries will be erected.

Chicago.—Liquid Carbonic Co., 3100 South Kedzie avenue, is having plans prepared for a $50,000 gas plant. The building will be of brick, concrete and steel construction. Specifications include steam heating, plumbing and electric lighting.

Chicago.—Stromberg Electric Co. has purchased 185,000 sq. ft. of land at the northeast corner of Wrightwood and Greenview avenues, and will erect a factory 220x200 ft., to cost approximately $160,000. R. T. Newberry will be the architect.

Chicago Heights, Ill.—Public Service Co. of Northern Illinois will in addition to the 2 present lines erect another 33,000-volt transmission line between Blue Island station and Chicago Heights. It will be of standard class A, 33,000-volt wood pole construction and will provide 4500-kv-a. additional line capacity between Blue Island and Chicago Heights.

Moline, Ill.—Moline Tool Co. has increased its capital stock from $12,500 to $168,500. A large part of the new capitalization will be used in the purchase and installation of new machinery.

Ohlman, Ill.—Ohlman Electric Light & Power Co. has filed a petition with the Illinois Public Utilities Commission for a certificate of convenience and necessity to construct and operate an electric light and power plant at Ohlman.

Peoria, Ill.—Permission to erect a $22,000 power plant for Proctor hospital has been granted by the building commissioner. The building will be of brick and steel construction and will furnish light, heat and power for the hospital.

Davenport, Ia.—Peoples Light Co. is building a 3-mile extension from Eldridge to Long Grove. This will

furnish Long Grove with power and light.

Jackson, Mo.—Missouri Iron & Steel Corp. is planning an immense project in the building of an hydro-electric plant at Green Spring in Oregon county and transmitting the power to its smelter near Brandsville for manufacturing electric steel.

Kansas City, Mo.—Kansas City Power & Light Co., the reincorporated Kansas City Light & Power Co., has opened its second 20,000-kw. generator at the new Northeast power station. When its two big generators are in service later this month, the company will be independent of the Kansas City Railways Co. for current, except in the downtown district. The company will retain its Kaw river plant for a while, at least, as a peak load or emergency plant. This station is across the Kaw river from the Kansas City, Kan., power house of the Kansas City Railways Co. The street railway company plans the dismantling of this plant.

Memphis, Mo.—Election to vote $10,000 bonds to enlarge and equip the light plant of the city carried.

Pierce City, Mo.—The equipment of the water plant with electrical power is contemplated.

St. Louis, Mo.—Wood & Lane Co., Syndicate Trust building, contemplates the purchase of 2 75-kw. to 100-kw., 3-phase, 60-cycle, 440-volt belted generators; 2 150-kw. to 200-kw., 250-volt direct-current engine-driven generator sets; 1 150-kw. to 200-kw., 3-phase, 60-cycle, 2300-volt generator and other electrical equipment.

Coats, Kan.—An election will be held in the near future to vote $20,000 in bonds for the construction of a transmission line to Pratt connecting with the plant there.

Hutchinson, Kan.—Work will begin as soon as possible on the construction of a new lighting system to extend from 5th avenue north to 17th avenue on Adams street.

St. Francis, Kan.—Plans and specifications have been submitted for the new electric light plant. As soon as the plans are accepted, bids will be called for and work will begin as soon as possible.

Geneva, Neb.—The lot at Lincoln and Center streets has been purchased by the Lincoln Telephone & Telegraph Co. A 2-story building will be erected there.

Orangeburg, S. D.—Jan. 15 bids will be received for the purchase of $45,000 electric light bonds. Address T. O. S. Dibble, city clerk.

SOUTH CENTRAL STATES.

Alabama City, Ala.—Gulf State Steel Co. will begin the enlargement of its steel wire plant and will also install new electric generating and transmission machinery, which will double its capacity. Improvements and extensions are expected to be completed by Apr. 1.

Huntsville, Ala.—Lincoln Cotton Mill is making arrangements for using electricity as motive power to drive its machinery when electric power generated in the Coosa river is made available by the Alabama Power Co. There are several other big industries that will abandon steam power for electric as soon as it is available.

North Birmingham, Ala.—Sloss-Sheffield Steel & Iron Co. has inaugurated construction work on a power plant at its new by-product works now in course of erection at North Birmingham, for the furnishing of electric energy for the operation of nearby mining properties.

Tallahassee, Ala. — Montgomery Light & Water Power Co. will rebuild its hydroelectric plant dam destroyed by flood and will expend about $1,000,000. S. B. Irelan, general manager.

New Orleans, La.—New Orleans Railway & Light Co. will enlarge its main powerhouse. Address John S. Bleecker, general manager.

Ft. Smith, Ark.—Ft. Smith Light & Traction Co. has been authorized to issue $112,500 worth of first mortgage bonds to be used in construction work. The company plans to extend its lines and make other improvements on the plant.

Magnolia, Ark.—More than half of the $75,000 for the installation of a city light and power plant has been subscribed by the business men of Magnolia.

Broken Bow, Okla.—City is having plans prepared for the construction of a new municipal electric light plant, estimated to cost $135,000. Hughes Engineering Co., 304 Bank of Commerce building, Tulsa, is engineer.

Cleveland, Okla.—A. A. Boyd, Michigan City, Ind., is understood to have completed negotiations for the purchase of the local plant of the Oklahoma Utility Co., and plans for extensions and improvements.

Okmulgee, Okla.—Fire which damaged the plant of the Lake Park Refining Co. to the extent of about $25,000, completely destroyed the boiler plant at the works. It is understood that the company plans immediate rebuilding.

Pryor, Okla.—The city will construct an 8-mi., 6600-volt transmission system. V. V. Long & Co., 1300 Colcord building, Oklahoma City, are consulting engineers.

Sapulpa, Okla.—Sapulpa Electric Co. (division of Oklahoma Gas & Electric Co.) secured a 10-year street lighting contract for the town of Bristow, Okla. The town of Bixby will purchase from the company energy for the operation of its water system and sewerage disposal plant. Bixby will also make a contract for street lighting. Ninety contracts for electric service have been closed at Mounds where service will be started within a short time. Over 125 customers have been connected in Beggs. A carload of electric washing machines has been ordered by one of the dealers at Sapulpa. A new electrical supply house will open a shop in a building now being constructed adjacent to the offices of the Sapulpa Electric Co.

Tishomingo, Okla.—Improvements are contemplated to the Tishomingo Light & Power Co.'s plant, which was recently purchased by the city.

Abilene, Tex.—Abilene Gas & Electric Co. will spend $40,000 in improving the street railway, which will be operated again. Address general manager.

Abilene, Tex.—American Public Service Corp. is considering plans for the construction of a new local electric light and power and ice manufacturing plant.

Alpine, Tex.—About $25,000 is to be expended in improving the lighting system of the Alpine Light & Ice Co. Work will begin about Feb. 1.

Big Springs, Tex.—Election to vote $50,000 in bonds for waterworks improvements carried. Plans will be made immediately and work will be started as soon as possible.

Houston, Tex.—Gulf Production Co. is arranging plans for the construction of two large new electric power stations and transmission systems to be located in the Goose Creek district to be used, it is said, for the furnishing of electric power for the operation of the pumps of the company's holdings in this field. The project, with equipment installation, is estimated to cost $500,000.

Yoakum, Tex.—Yoakum Commercial Club contemplates the establishment of a garment factory and install electrically driven sewing machines.

WESTERN STATES.

Seattle, Wash.—City has awarded a contract for the installation of 3 new 5000-kv-a. capacity transformers at the municipal light plant at Cedar Falls, the equipment to cost about $24,750.

Tacoma, Wash.—City council is having plans prepared for the immediate installation of a new electric street-lighting system, ornamental type, on North D street.

Vancouver, Wash.—Plans are under consideration for the early installation of a new electric street-lighting system, cluster light type, on Main and Washington streets.

Portland, Ore.—In connection with the proposed rebuilding of the plant of the North Portland Box Co., recently destroyed by fire with loss estimated at $25,000, it is understood that the entire works will be electrically operated.

Portland, Ore.—Coast Steel & Machinery Co. has purchased the electrical equipment which had been accumulated by the Spruce Division of the War Department at various Oregon plants. It included motors and transformers. This company also bought the 34 shipyard motors of the Foundation Co., in Portland.

Chico, Calif.—The enlargement of the Nevis dam of the Great Western Power Co., Lake Almanor reservoir, Plumas county, is contemplated as a result of demands for water made by Sacramento Valley farmers and rice growers. This is, according to H. F. Caulthard, manager of the Western Canal Co., who states that

the present demand for irrigation water will bring a widening of the canal lines of the company and raising of the Big Meadows dam.

Chico, Calif.—Arrangements have been made for the installation of a new electric lighting system in the annexed district of Chico, power to be furnished by the Pacific Gas & Electric Co.

Fillmore, Calif.—Plans are under consideration by the Sespe Light & Power Co. for the construction of a large new local power plant. The company is understood to be arranging for the acquirement of a site for the proposed works, and other details are now being completed.

Los Angeles, Calif.—Southern California Edison Co. has awarded a contract to MacDonald & Driver, 608 Hibernian building, for the construction of the proposed substation at Richgrove, Tulare county. The structure will be 3-story, reinforced concrete, about 67x131 ft., and is estimated to cost, including equipment installation, $111,000.

Oakland, Calif.—Complete reorganization of the street lighting system provided for in a resolution recently passed by the city council, which calls for adoption of changes recommended by Carl Hardy, superintendent of the city electrical department. In many instances the old gas lights will be abandoned and more modern electric lights installed.

Redding, Calif.—In connection with the construction of the proposed hydroelectric power plant in the Big Bend district by the Pacific Gas & Electric Co., the plans of the company provide for an expenditure of approximately $10,000,000 for the development in a period of 2½ years.

Richmond, Calif.—The city is to have an up-to-date system of street lighting. Three main business thoroughfares of the city are to be equipped with electroliers. This was decided by the council and a meeting of the property owners and the merchants has been called to further discuss the subject.

San Diego, Calif.—Pacific Telephone & Telegraph Co., 1132 6th street, has had plans prepared for alterations and improvements in its brick building at 1027 6th street, to facilitate operations. The work is estimated to cost $12,000.

Sanger, Calif.—City trustees have approved an ordinance providing for the immediate installation of a new electrolier lighting system in the business section of the municipality.

Stockton, Calif.—Western States Gas & Electric Co. has been awarded the contract for street lighting to run for a period of 5 years. Notwithstanding greatly increased production costs the central station company was able to reduce the rate below that previously paid and to waive the surcharge of 10% authorized by the California Railroad Commission.

Taylorsville, Calif. — Plans have been completed and arrangements made by the Feather River Co. for the installation of a large quantity of electrical equipment, including compressor and other machinery at its plant. George W. Long, Phoenix, Ariz., heads the company.

PROPOSALS

Power Plant Equipment. — Bids will be received until Jan. 13 at Clarksdale, Miss., for the installation of power plant equipment, to include a 1500-kw. turbogenerator, condenser, necessary cooling apparatus; boiler feed pump to furnish 110 g.p.m. against 200-lb. pressure. Walter S. Bobo, city engineer.

FOREIGN TRADE

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electrical Machinery (31,662)—An electrical engineer in Argentina desires to purchase electrical machinery, motors, dynamos, etc., for medium size power electric plants (100 to 200 hp.), and requests immediately catalogs giving detailed specifications. Payment, cash. Correspondence should be in Spanish. Reference.

Flatirons, Electrical Machinery (31,689)—A firm of manufacturers in Spain desires to secure the sole agency on commission for the sale of electrical machinery, and supplies, electric flatirons, machinery belting, rubber goods, etc. Correspondence should be in Spanish. References.

Ice-Making Plant and Lighting Plant (31,691)—A commercial agent in the West Indies desires to purchase a light weight speed-motor marine engine of 80 hp., including marine equipment; and a small ice-making plant of a maximum capacity of 3 tons, preferably combined with an electric lighting plant sufficient for 250 16-candle lights. References.

INCORPORATIONS

Louisville, Ky.,—Country Home Power & Lighting Co. has incorporated with a capital of $30,000. W. G. Simpson, Jr., Louisville, Hubert and Graham Vreeland, Frankfort, Ky.

Eau Claire, Wis.—Eau Claire Electric Equipment Co. has been incorporated for $15,000 and will engage in transmission line construction, wiring. design and construction of electric power plants, etc. C. O. Pierce is president; G. A. Dickson, secretary, and Alvin Peterson, treasurer.

Connersville, Ind. — Tri-County Electric Co. has been incorporated with capital of $10,000 to engage in the manufacture of electrical appliances. The incorporators are L. B. Huck, Earl Wiley and F. F. Russell.

Goodland, Ind.—Goodland Manufacturing Co. has been incorporated with capital of $250,000 to engage in the manufacture of electrical supplies. The directors are Lawrence Romine, Dale A. Rowe and E. E. Kertis.

Hudson, Ia. — Farmers' Electric Co. has incorporated with a capital of $50,000 and will buy and sell electricity for light, power and other purposes and to erect a transmission line.

Laurel, N. C.—Laurel Hill Electric Co. Capital, $25,000. To operate a local plant for the generation and distribution of electric energy. G. McN. Pate, and Z. V. Edwin are the principal incorporators.

New York, N. Y.—Electric Outlet Co. Capital, $15,000. To manufacture electrical goods. Incorporators: R. A. Maclean, F. H. Butehorn, and E. S. Hawley, 50 Vanderbilt avenue.

New York, N. Y.—Greater New Gas & Electric Supply Co. Capital, $15,000. To manufacture electrical and gas supplies, etc. Incorporators: D. Server, F. Goldman, and B. Silfen, 146 Bowery.

New York, N. Y.—Petroleum Power Devices Corp. Incorporated under Delaware laws with a capital of $10,000,000. To manufacture hydrocarbon converters, and other equipment. Incorporators: Ralph H. Beach, W. B. Hill, New York; and Arthur J. Weiss, Orange, N. J.

Piermont, N. Y.—Electrical Apparatus Export Corp. Incorporated under Delaware laws with a capital of $50,000. To engage in the exportation of electrical equipment. Incorporators: O. B. King, Warren S. Orton, East Orange, N. J.; and Albert M. Austin, Piermont, N. Y.

Parkersburg, W. Va.—National Insulating Co. Capital, $40,000. To manufacture insulation specialties, etc. Incorporators: T. Logan, J. Marshall, C. D. Forrer, M. E. Hiehle, and R. Fields, Parkersburg.

Wilmington, Del.—Cannon Ball Alarm Co. Capital, $450,000. To manufacture electric burglar alarm systems, etc. Incorporators: M. C. Kelly, M. L. Horty, and S. L. Mackey.

Louisville, Ky. — Country Home Power & Lighting Co. Capital, $30,000. To operate an electric light and power system. Incorporators: W. G. Simpson, Jr., Louisville; and Hubert and Graham Vreeland, Frankfort, Ky.

El Paso, Tex.—El Paso Battery & Ignition Co. Capital, $15,000. To manufacture electric batteries, ignition systems, etc. Incorporators: S. H. Parmelee, P. C. Morey, and J. C. Dunlavy.

Fort Worth, Tex.—Texas Battery & Starter Co. Capital, $15,000. To manufacture electric batteries. W. O. Parker and R. H. Dyer are the principal incorporators.

Chicago, Ill.—Jenkins Hydraulic Hoist Co. has been incorporated with $12,000 capital by John R. Junkin, Floyd I. Clark and Frank W. Fries.

Personals

Edward D. Kilburn Elected Vice-President of Westinghouse International Co.—George Weston Expires—Changes

CLAUD M. HURD, treasurer of the United Light & Railway Co., Grand Rapids, Ia., has resigned and will open an office in Grand Rapids where he will deal in bonds and stocks.

J. C. MACKRELL, JR., on Jan. 1 assumed his new duties as sales manager of the Electric Welding Co., Pittsburgh. He was for several years connected with the Witherow Steel Co., Pittsburgh, as district manager of sales in Ohio and West Virginia.

W. A. CAMP, formerly production manager of the Franklin Electric Co., has joined the Wolcott Manufacturing Co., Hartford, Conn., in charge of production of the Mermaid dishwasher. Mr. Camp was associated with the Franklin company for almost 4 years prior to the time the company was taken over by the Westinghouse interests.

DR. WILLIAM H. WALKER, for many years head of the Research Library of Applied Chemistry at the Massachusetts Institute of Technology, has been named as head of the Institute's new division of industrial co-operation and research. Dr. Walker was connected with the Institute for 25 years before the war, and during the war served as colonel in the Chemical Warfare Service. He was in command of Edgewood Arsenal, Maryland, and was awarded the Distinguished Service Medal.

ALEXANDER C. BROWN, of Cleveland, has been elected president of the Northeastern Ohio Division of the Netherlands Government to study water president of the Brown Hoisting Machinery Co., vice-president of the Cleveland Chamber of Commerce, and a leader in civic and social organizations generally. Throughout the war he did important executive work for the Red Cross and other organizations. The success of the Eighth Annual Safety Congress and the Safety Week campaign conducted at Cleveland concurrently with the recent congress is due in large measure to Mr. Brown's efforts as chairman of the finance committee of the Northeastern Ohio Safety Council.

W. BLAZER, civil engineer of the Government service for water power and electricity, Dutch East Indies, and whose headquarters are at Bandoeng, Java, is visiting Canada and the United States under a commission from the Netherlands' government to study water power stations. It is understood that the water-power potentialities in the islands of the Dutch East Indies total several million horsepower. The government has developed and is operating several plants generating power for railway shops, etc. There are over 300 private water-power plants for plantations and other industries, and the government is pursuing an active development policy. Mr. Blazer intends also to visit Switzerland.

H. G. SIMPSON, formerly of Redding, Cal., is now manager of the municipal lighting system at Gridley.

PROF. DR. Y. FURUYA, associated with the electrical engineering department of the Kiushiu University, Japan, is visiting the United States on a tour of inspection, studying water-power developments in this country.

DOUGLAS BROOKMAN, who held the office of attorney for the California Railroad Commission since 1914, has entered into partnership with Attorneys Golden K. Bell, W. M. Simmons and Harry M. Creech. The new firm will be known as Bell, Brookman, Simmons & Creech, and will have offices in the Alaska Commercial building, at San Francisco.

EDWARD D. KILBURN, who since March 15, 1917, has been New York district manager of the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., was recently elected vice-president and general manager of the Westinghouse Electric International Co. Mr. Kilburn was graduated from Cornell University, and immediately after leaving college he entered the employ of the Westinghouse Electric & Manufacturing Co., for a number of years being located at the Syracuse office of the company. Subsequently, he was transferred to the Westinghouse Machine Co. with headquarters at New Haven, Conn. In 1915 he returned to the electric company as manager of the power division of the New York office. A year later he was also made manager of the railway and lighting divisions, subsequently becoming manager of the office. MAURICE COSTER, who has been actively engaged for more than 30 years in handling the foreign interests of the Westinghouse company, continues as vice-president of the International company with advisory duties. The president of the International company is Loyall A. Osborne, who is senior vice-president of the electric company and was actively engaged in national work during the war, having been chairman of the executive committee of the National Industrial Conference Board, chairman of the committee of the Council of National Defense, a member of the National War Labor Board, and other important bodies. The Westinghouse Electric International Co. was formed in the spring of last year to succeed the Westinghouse Electric Export Co. It handles the Westinghouse foreign business and is world-wide in its scope, exclusive of the United States and Canada.

H. B. CAMP has become associated with L. V. Estes, Inc., a firm of industrial engineers of Chicago. He is now engaged in the installation of an organization and a system for production control in an engine building plant in Birmingham, Ala. Before accepting this position Mr. Camp was equipment engineer for the Western Concrete Co., East Alton, Ill., in which position he had charge of the design and installation of the entire equipment of the engineering and chemical division of that company.

OBITUARY.

JOHN HERBERT SNELLING, president of the Marine Manufacturing & Supply Co., died on Dec. 31 at his home in East Orange, N. J. He was an electrical and marine engineer who produced many devices used by submarines and destroyers during the war, He was for many years associated with the Crescent Shipyards, and also directed the alterations made on the *Shamrock III.*

GEORGE WESTON, well known builder of electric railways and electrical engineer, died suddenly Jan. 7 in his hotel apartments in Philadelphia. News of his death was a shock to his many friends, inasmuch as he appeared to be in perfect health. Mr. Weston was born in Kalamazoo, Mich., Jan. 20, 1861, was educated in the public schools of that city, and joined the engineering corps of the Missouri, Kansas & Texas Railway Co. when he was 19 years old. In Chicago he built the Clybourn, Milwaukee and Blue Island avenue and Halsted street cable lines and 75 miles of horse-car lines, all of which he later electrified. He superintended the construction of the Suburban Railway Co. of Chicago lines, also the Tennessee Central railway. He was a member of the firm of Weston Brothers, consulting and constructing engineers, from 1901 to 1903. From 1907 to 1914 he served as assistant chief engineer and city member of the Board of Supervising Engineers, Chicago Traction, and from 1914 to 1918 he was engineer of the board, later specialiizng as transportation engineer and in valuation of public utilities. Mr. Weston was considered one of the foremost authorities on valuations of public utilities, particularly for street railway companies. He had been connected for some time with the American Electric Railway Association, in the capacity of valuation engineer, and at the time of his death he was engaged, in addition to his valuation duties, in educational work among public utility commissions. He was a member of the American Institute of Electrical Engineers, American Society of Civil Engineers, Western Society of Engineers, and the Masons. He also held membership in the Engineers' Club of New York and the Chicago Athletic Club. The deceased is survived by his widow and two brothers, Joseph Weston, of New York, and Charles V. Weston, of Chicago.

For the Readjustment Period—What?

LXII.

Some Earnest Thoughts for The New Year

Let's get our heads out of the clouds—and clear our eyes of impractical visions.

Ideals are good, but they must be practical. Practical ideals are workable ideals. And work is the only way to put a workable ideal across.

We have our practical— our workable ideal. It is to lower the cost of living and increase prosperity. Strikes—higher wages—will not do it. Revolutions will not do it. Talk will not do it. Work only will do it.

The World—America has been on too long a holiday. We have been too long starting—to commence —to begin—to prepare to work. Let's cut out the preparation and get down to real work.

America is a land of plenty. There is enough and to spare if we will work for it, but we must work hard. Let's get down to earth. Let's put our feet on the road to prosperity. Let's work, work, work. Let's put in more hours of work—8, 10, 12, 16 hrs.

Let's make each hour a bigger hour—a fuller hour—a more resultful hour than ever before.

"There is no fun like hard work." There is no joy like the joy of accomplishment. When we work we see straight, think straight, act straight.

Mischief — want — starvation — discontent — crime — immorality are the unlovely children of idleness.

There's nothing wrong with the world. All it needs is more production—more real honest work of hand and brain. Let each man do his job and all will be right with the world.

Many inside workers—clerks, the advertising men, planners, or executives—are working more hours, putting more nervous energy into their work than ever before. They have their feet on the ground. By example they are pointing the road to prosperity. They are trying to cut down the cost of living by giving overflowing value for their salaries. It's up to the skilled tradesmen to do the same. Then and only then will high costs lower.

Prosperity can't be gained by division—or subtraction. Prosperity comes only from addition. Production is addition to the supply of the world's goods.

It's as simple as A, B, C. There's no complex social problem. The world has no wasting disease. It has rested too long, that's all. We used up our surplus store of the things we enjoy. We must replace them. We must catch up.

This means work for you and work for me. It means work to make the worker see the path to prosperity. It means work, work, work and then more work.

Talk about profiteers. The man who tries to get more pay for half-hearted work is the greatest menace to the country today.

The advertising man's slogan is "honor the workers—make it hot for the shirkers."

Men—let's pull together—work together—and keep our feet on the ground. Let's change "wishing" to "working." The advertising men are showing the way.

Get on your feet, America. Carry on—and follow through for one year. And the world will smile.

WILLIAM H. RANKIN, Chicago

Financial News

Public Utility Maturities Numerous in 1920.

While the number of public utility securities falling due in 1920 is unusually large the aggregate is only $196,296,800, against $261,887,600 in 1919 and $210,500,000 in 1918. During 1919 public utility bonds called in advance of maturity aggregated $5,108,000. A feature of 1920 maturities is the large number of short term obligations falling due.

Owing to tight money and other restrictions during the war period, utility corporations did not find it advantageous to issue long term bonds and were obliged to resort to short term notes to tide them over abnormal times. Should money become easier in 1920 doubtless many of the maturing obligations will be refunded with long term issues.

Among large and important items falling due in 1920 are Consolidated Gas Co.'s debenture 6s for $24,279,779, due Feb. 1. These bonds are convertible into stock at par. The company has already floated a new issue carrying 7% interest to provide for retirement of the 6% debentures.

Toledo Traction, Light & Power Co. 2-year 7% notes for $10,500,000 fell due and were paid off Jan. 1. The company has floated a new issue of $10,000,000 first lien 7% 2-year bonds which were offered to the public at 99 yielding over 7½%.

General Electric Debenture Bonds.

The General Electric Co. has announced a plan to give its employes an opportunity to subscribe to what will be known as employes' 6% debenture bonds of the company, and to United States Government 4¾% Victory notes, on long time payments.

The board of directors has authorized a special issue of 15-year debenture bonds dated Sept. 1, 1919, for this purpose. Both bonds and notes will be offered in denominations of $50, $100, $500 and $1000. Employes in service one year or more may subscribe in amounts not exceeding $1000.

No pressure of any kind will be brought to bear on the workers to subscribe, the aim of the company being to encourage savings by providing investments of undoubted safety and security upon attractive terms of payment. The plan affects all the employes of the company.

Metropolitan Edison Increases Stock.

Notice has been filed with the Secretary of State by the Metropolitan Edison Co. of an increase in its capital stock from $4,150,000 to $5,500,000, the proceeds to be used for improvements and extensions in its plant and system, including the installation of additional equipment and the construction of power transmission lines.

Trade Acceptances.

An extensive demand from business men in all parts of the country for copies of the booklet entitled "Trade Acceptances—What They Are and How They Are Used," by Robert H. Treman, formerly Deputy Governor of the Federal Reserve Bank of New York, and published by the American Acceptance Council, 111 Broadway, New York City, is necessitating a new and large printing. This booklet is valuable not only for those who for the first time are seeking information as to the trade acceptance method, but for those who have already adopted it in their respective lines of business.

The American Acceptance Council has published during the past year an extensive list of titles dealing not only with trade acceptances but also with bankers' acceptances, and will continue to add at frequent intervals new pamphlets and folders dealing in a practical way with related subjects. These are sent without charge to business men who desire them for study and guidance. The council particularly requests that those desiring copies of the booklet by Mr. Treman communicate their requests without delay.

Corporate Financing Large During December.

Despite large Government financing in 1919 and an unusual amount of foreign loans floated in this country corporate financing was by far the largest in history. Total of railroad, public utility and industrial issues issued during the year was $2,944,958,000, against $1,215,992,000 in 1918. Great prosperity of industrial corporations is shown by the amount of loans floated during the year, $2,103,186,710.

Corporation loans floated during December aggregated $226,728,200, against $294,345,100 in November and $195,807,400 in December, 1918.

Absence of any railroad financing was again a feature of last month's loans. This of course was due to the fact that the time for the return of railroads to private operation was drawing to a close. Much railroad financing has been postponed pending legislation by Congress. In December, as usual, during the year, bulk of new issues was put out by industrial corporations for expansion purposes. The ability of these companies to sell stock, as well as bonds, bespeaks confidence for the future progress of the industrials despite the high money rates and unsettlement of many economic questions.

Amount of bonds, notes and stock issued by railroad, industrial and public utility corporations in December, 1919, and 12 months, with the totals for cash class of corporation and for each class of security, follow:

December:	Bonds.	Notes.	Stock.	Total.
Railroad	.....	.....	.....	.....
Industrial	$ 23,400,000	$ 850,000	$ 132,306,400	$ 156,556,400
Public utility	52,245,300	12,300,000	5,626,500	70,171,800
Total	$ 75,645,300	$ 13,150,000	$ 137,932,900	$ 226,728,200
12 months:				
Railroad	$118,330,600	$132,580,000	.....	$ 250,918,600
Industrial	301,475,000	219,136,000	$1,582,575,710	2,103,186,710
Public utility	272,335,300	252,408,500	66,108,890	590,852,690

Assessment of National Conduit & Cable Reduced.

National Conduit & Cable Co., New York, N. Y., has been handed down an order by the Supreme Court granting a reduction of the 1918 assessment from $2,120,000 to $1,272,480 on its plant at Hastings-on-the-Hudson, a decrease of $848,320, or 40% lower than the assessment fixed by the Hastings assessors. In this connection, the company has also been granted a judgment of $9918.37 against the village, the amount of overpayment of taxes for 1918, with interest from July 19, 1918.

Dividends.

Massachusetts Lighting Co. has declared the regular quarterly dividend of $1.50 on preferred stock, payable Jan. 15 to stock of record Dec. 26.

Northern States Power Co. has declared a quarterly dividend of 1¾% on preferred stock, payable Jan. 20 to stock of record Dec. 31.

Edison Electric Illuminating Co. of Boston has declared a quarterly dividend of 3%, payable Feb. 2 to stock of record Jan. 15.

Milwaukee Electric Railway & Light Co. has declared a quarterly dividend of 1½%, payable Jan. 31 to stock of record Jan. 30.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeiler & Co., Rookery Bldg., Chicago.

Public Utilities.	Div. rate. Per cent.	Bid Dec. 30.	Bid Jan. 6.
Adirondack Electric Power of Glens Falls, common	6	13	14
Adirondack Electric Power of Glens Falls, preferred	6	80	77
American Gas & Electric of New York, common	10+extra	120	123
American Gas & Electric of New York, preferred	6	39	40
American Light & Traction of New York, common	..	204	200
American Light & Traction of New York, preferred	6	90	90
American Power & Light of New York, common	4	65	66
American Power & Light of New York, preferred	6	73	73
American Public Utilities of Grand Rapids, common	..	8	8
American Public Utilities of Grand Rapids, preferred	7	20	22
American Telephone & Telegraph of New York	..	96	97¼
American Water Works & Elec. of New York, common	..	2	2
American Water Works & Elec. of New York, particip	7	4	6
American Water Works & Elec. of New York, first preferred	..	35	45
Appalachian Power, common	..	3	4
Appalachian Power, preferred	7	22	20
Cities Service of New York, common	+extra	400	410
Cities Service of New York, preferred	6	70	73
Commonwealth Edison of Chicago	8	106¾	107½
Comm. Power, Railway & Light of Jackson, common	..	14	17
Comm. Power, Railway & Light of Jackson, preferred	6	39	44
Federal Light & Traction of New York, common	..	7	7
Federal Light & Traction of New York, preferred	..	41	41
Middle West Utilities of Chicago, common	2+extra	20	20
Middle West Utilities of Chicago, preferred	6	41	42
Northern States Power of Chicago, common	..	60	60
Northern States Power of Chicago, preferred	ex.div.7	88	88
Pacific Gas & Electric of San Francisco, common	..	60¼	61¼
Pacific Gas & Electric of San Francisco, preferred	6	..	..
Public Service of Northern Illinois, Chicago, common	7	75	75
Public Service of Northern Illinois, Chicago, preferred	6	85	87½
Republic Railway & Light of Youngstown, common	4	12	11
Republic Railway & Light of Youngstown, preferred	6	40	41
Standard Gas & Electric of Chicago, common	..	27¼	..
Standard Gas & Electric of Chicago, preferred	6	41	..
Tennessee Railway, Light & Power of Chattanooga, common	..	2	1
Tennessee Railway, Light & Power of Chattanooga, preferred	6	5	6
United Light & Railways of Grand Rapids, common	4	25	25
United Light & Railways of Grand Rapids, preferred	6	57	57
Western Power of San Francisco, common	..	20	21
Western Union Telegraph of New York	extra	87⅛	88¼
Industries.			
Electric Storage of Philadelphia, common	4	..	..
General Electric of Schenectady	8	135	133
Westinghouse Electric & Mfg. of Pittsburgh, common	7	169½	170¼
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	54¼	54⅞